# ELECTRICAL REVIEW

FRIDAY
1 AUGUST 1959

WEEKLY
PRICE 1s 6d



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DETROIT



safety first

with SIEMENS EDISWAN earth leakage circuit breakers

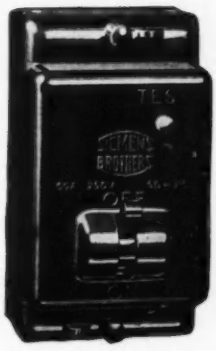
**60 amp. TP and TP & N**
CATALOGUE No. PM 60T and T.N.
For industrial use. Supplied with or without overload coils on each phase, and with or without neutral link. Extended terminal covers, fitted with rubber grommets, are available for use with T.R.S. cable or conduit.

**15 amp. DP 'Safetrip' Switch Socket**
CATALOGUE No. EL.15
Suitable for 13/15 amp. 250v. circuit; complete earth leakage protection for domestic apparatus using up to 3kw. Available also as switch only.

**15 amp. DP**
CATALOGUE No. ET.15D

**15 amp. DP with 13 amp. socket**
CATALOGUE No. EL 15/S
A compact unit giving earth leakage protection on subcircuits supplying domestic apparatus. Gives easy connections without use of extended terminal covers. Double enclosures are added protection against dust.

**Type ET.60D Circuit Breaker**
*Suitable for 60 amp. 250v. circuit; for use as consumers' main switch in small dwellings, especially in rural areas, and for protection of farm equipment or industrial tools. Overload protection can be supplied, and extended terminal covers, fitted with rubber gaskets, are available for use with T.R.S. cable or conduit.*




**SIEMENS EDISON SWAN LTD**
*An A.E.I. Company*
Distribution Equipment Division
38-39 Upper Thames Street, London, E.C.4
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*Telegrams:* Sieswan Cent London

MORE
POWER
FOR
INDUSTRY

WITH

BICC
CABLES

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 Bloomsbury Street, London, W.C.1

# Heatrae

## of Norwich

**ONE POINT FIVE**
1·5 GALLONS.

The new LIDO Water Heater, made in three popular sizes :

| | | |
|---|---|---|
| 1½ Gallon ..... | Loading | 1 kW. |
| 2·2 Gallon ..... | „ | 1 kW. |
| 3 Gallon ..... | „ | 2 kW. |

Standard Finish :
All White or All Cream.

**TWO POINT TWO**
2·2 GALLONS

These Heaters are real winners and will help your sales.
Ask for Leaflet No. 90, which will give full details and prices.

**THREE**
GALLONS.

# HEATRAE LIMITED

***Pioneers since 1920 in all-electric water heaters***

## NORWICH – ENGLAND

Telephone : NORWICH 25131 (Private Exchange) Telegrams : HEATRAE • NORWICH

Manufacturers of Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Electric Fires, Flameproof Heating Apparatus, Food Trolleys, Warming Plates, Air Heaters. Specialists in Steam Heated Oil Heaters and Calorifiers for Shipboard.

A

# You don't need a Secretary —

## to tell you that underfloor cables must be reliable

*Be sure and specify*

# "Florawarm"

**FLOOR HEATING**
**AND**
**STORAGE HEATING SYSTEM**
*incorporating*
**WANDLESIDE CABLES**

Underfloor heating systems provide safe and efficient warmth and comfort at an economical cost, taking advantage of "off-peak" tariffs. Especially suitable for Factories and Offices and other large buildings.
Consult our technical dept. or send for details of installation. Samples and leaflets on request.

*Made by*

**wandleside of wandsworth**

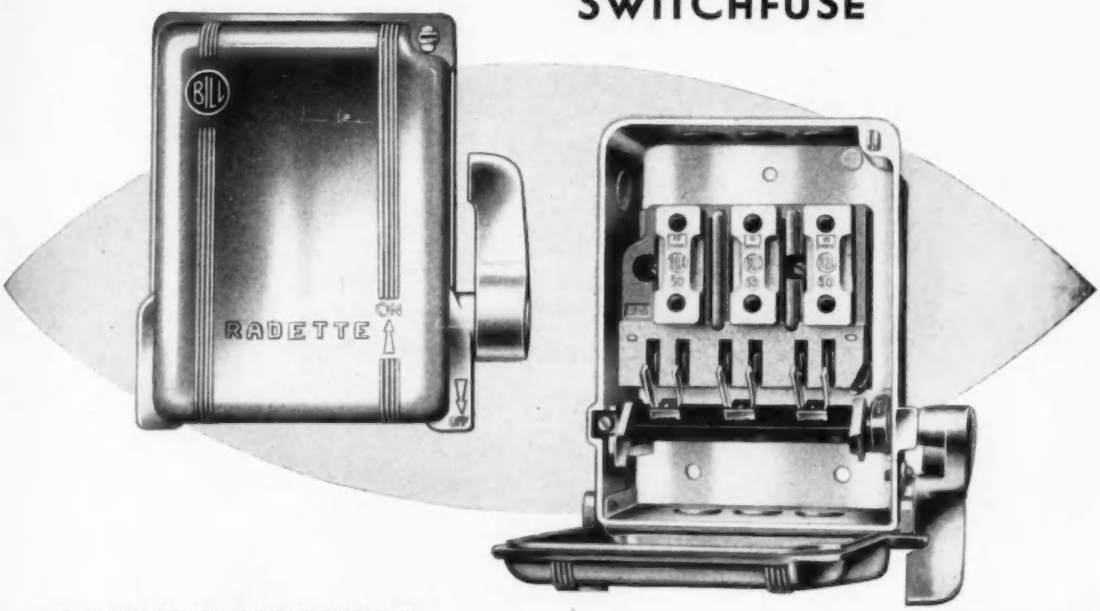
**WANDLESIDE CABLE WORKS LTD**
ONE OF FALKS GROUP

*106 Garratt Lane, Wandsworth, London, S.W.18*
*Telephone: VANdyke 7544 (7 lines)*
*Telegrams: "Wandleside, London"*
*London Office: 19/21 Fitzroy St., W.1. Tel.: Langham 8317*

*You cannot buy better gear*

# BILL RADETTE Q1438 MARK II

## THE MODERN MOTOR CONTROL SWITCHFUSE




- DESIGNED FOR CONTROLLING SMALL MOTORS NOT EXCEEDING 5 H.P.
- 10 AMPERE 500 VOLTS, 3 PHASE, QUICK MAKE AND BREAK SWITCH WITH SUBSTANTIAL CONTACTS FOR HIGH CONTACT EFFICIENCY AND LONG LIFE
- BILL ARC DAMPING TYPE FUSES FITTED COMPLETE WITH FUSE WIRE BY QUICK ACTION CLAMPS
- AMPLE KNOCKOUTS AND GENEROUS WIRING SPACE PROVIDED. 3—¾" KNOCKOUT HOLES TOP AND BOTTOM. 1—¾" KNOCKOUT HOLE IN LEFT HAND SIDE FOR STARTER CONNECTION.
- 'THROUGH' WIRING ARRANGED UNDER THE SWITCH BASE
- NO DISMANTLING OF SWITCH MECHANISM IS NECESSARY
- SOLID FORTOL BRUSH BAR TO ELIMINATE EARTHING
- FINISHED IN BILL SILVERLOSE— A DURABLE STOVED ALUMINIUM ENAMEL

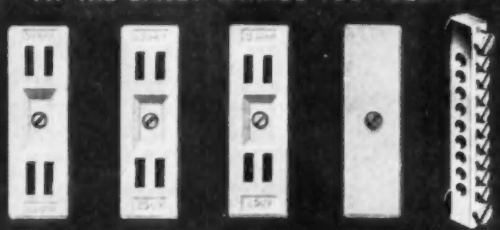
**BILL SWITCHGEAR LTD.**
**ASTON LANE · PERRY BARR**
**BIRMINGHAM·20**

LONDON, S.W.1 A. W. ZELLEY, N. PAYNE, R. W. HANKINSON GILLINGHAM ST. · MIDLANDS G. H. GARBETT, H. WILLIAMS HEAD OFFICE · NORTH MIDLANDS E. G. BACHELOR HEAD OFFICE · EAST MIDLANDS J. A. PEARCE, HEAD OFFICE · BRISTOL 3 W. L. WHITE, CHURCH LANE · LEEDS, 14 N. SHARPLES, G. SUTTON, WOODLANDS FACTORY · CHELTENHAM C. GEARING, HIGH ST. · MANCHESTER 3 H. H. POLLARD, J. H. RAMSAY, F. A. MAYOR, WOOD STREET · GLASGOW J. D. HARRIS, SANDYFORD PLACE · BELFAST J. BALLENTINE DONEGALL ST.

# MEMERA the unit which set a new high standard in the industry

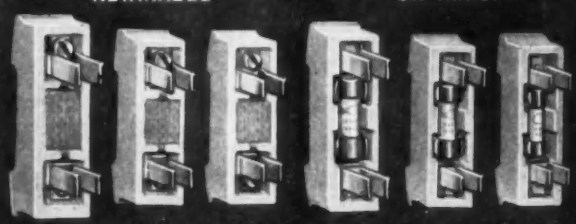
TAKE THE STANDARD CHASSIS

FIT THE SHIELD RATINGS YOU REQUIRE



ONLY THE RIGHT FUSE HANDLE RATINGS WILL THEN FIT

REWIRABLE OR H.R.C.



30 AMP 15 AMP 5 AMP 30 AMP 15 AMP 5 AMP

If the job calls for unusual fuse combinations, it's no trouble at all with Memera. No other equipment gives you the same versatility as Memera.

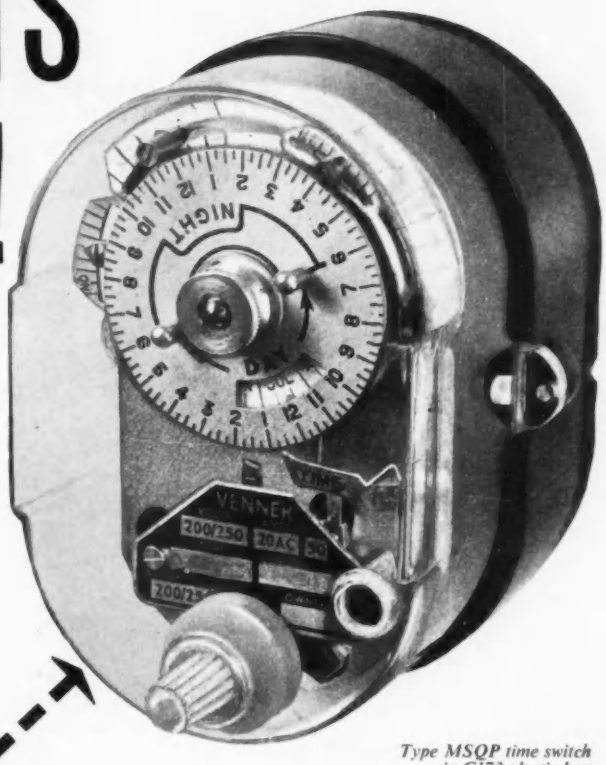
The system is so delightfully simple. The chassis is the same for all combinations. Just fit the appropriate shields to suit the fuse ratings you need for the job. Once these are fitted, only the correctly rated fuse handles can be inserted.

And of course with Memera there is the big advantage that you can use either rewirable or H.R.C. fuses.

SILVER AND BRONZE MEDALS
BRUSSELS WORLD EXHIBITION 1958
Engineering Centre, Collective Exhibit

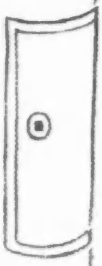
MEM MIDLAND ELECTRIC MANUFACTURING CO. LTD. · TYSELEY · BIRMINGHAM 11

# STREETS AHEAD!




*Type MSQP time switch in C173 plastic box with transparent cover.*

*Type MSQP time switch in C151 die cast aluminium box.*



For efficiency and economy in street lighting there is nothing to touch the Venner Type MSQP Time Switch. It has a large dial for easy setting, small overall dimensions to fit into modern street columns and can be supplied with a clear plastic clip-on cover or in a metal die-cast box with top clip fastening.

*You are invited to send for full details of Venner Solar Dial Time Switches, write for leaflet E.R./16.*

**VENNER** Time Switches

**VENNER LIMITED, Kingston By-Pass, New Malden, Surrey • Telephone: MALden 2442**

# More advantages

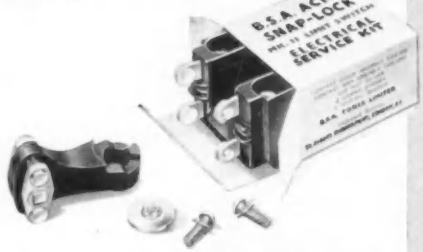
A TYPE APPLICABLE TO EVERY INDUSTRY

## in Mark II SNAP-LOCK heavy duty limit switches

WATER
OIL
AND
DUSTPROOF
OR
FLAMEPROOF
VERSIONS

*Now* **TWO ONLY REPLACEABLE UNITS IN THE ELECTRICAL SIDE**

There are only two assemblies in the electrical side of B.S.A. ACME SNAP-LOCK Mk. II limit switches: a moulded one-piece contact block and the contact arm. Interchangeable on all models they are designed for easy replacement. Service kits comprising these items, complete with holding nut and fixing screws, are supplied at moderate cost.



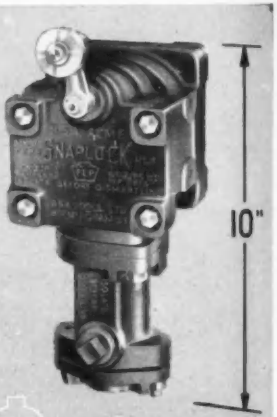

B.S.A. Acme Snap-Lock heavy duty limit switches have an established reputation for reliability under the most arduous conditions. Recently introduced Mark II versions retain proved features of their forerunners but incorporate refinements in design and manufacture principally to simplify servicing, provide complete interchangeability of assemblies, increase electrical resistance to earth and ensure lasting efficient sealing. Please ask for the Mark II catalogue.

STANDARD

**WATER, OIL & DUST PROOF**

*Single pole, double break, double throw, operates with either circuit normally open with other closed, or maintaining in either position, or available with central (neutral) position and/or centre connection. Heavy aluminium die-cast case. Water, oil and dust proof. Conduit ¾ in. B.S., or No. 3 Admiralty Pattern Cable gland entry. Two-screw side mounting or backplate mounting in two styles, or Tandem style (back to back mounting). Operating lever position adjustable in 7.5 deg. increments through 82.5 deg. either way from normal.*

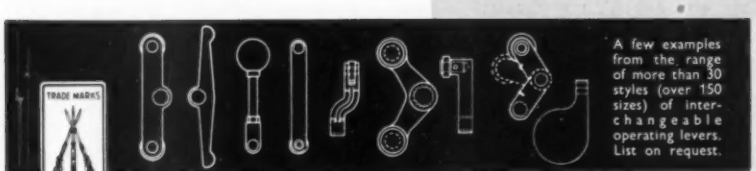
## STANDARD NEUTRAL POSITION OR CENTRE CONNECTION




FLAMEPROOF

**SINGLE OR DOUBLE ENTRY**

*Buxton certificates No. 3574 (Group I) No. 3575 (Groups II and III gases). Meehanite iron castings. Self wiping solid silver contacts, interchangeable plugs and sockets. Internal mechanism removable as a unit for servicing.* **Single SWA cable entry (standard); double entry if required.** *Operating lever position adjustable in 7.5 deg. increments through 360 degs. Single pole, double break, having one normally closed and one normally open circuit. Available with central (Neutral) position and/or centre connection.*




A few examples from the range of more than 30 styles (over 150 sizes) of interchangeable operating levers. List on request.

Made in England under Licence by B.S.A. TOOLS LIMITED, BIRMINGHAM 33

*Sole Agents U.K.*

**BURTON GRIFFITHS & COMPANY LIMITED**
SNAP-LOCK DIVISION, 93 ALBERT EMBANKMENT, LONDON, S.E.11
PHONE RELiance 3891

B.S.A.
SNAP-LOCK
ACME

463

# PHILIPS

## *Free Lighting Design Service...*

## can sell more for you, too!

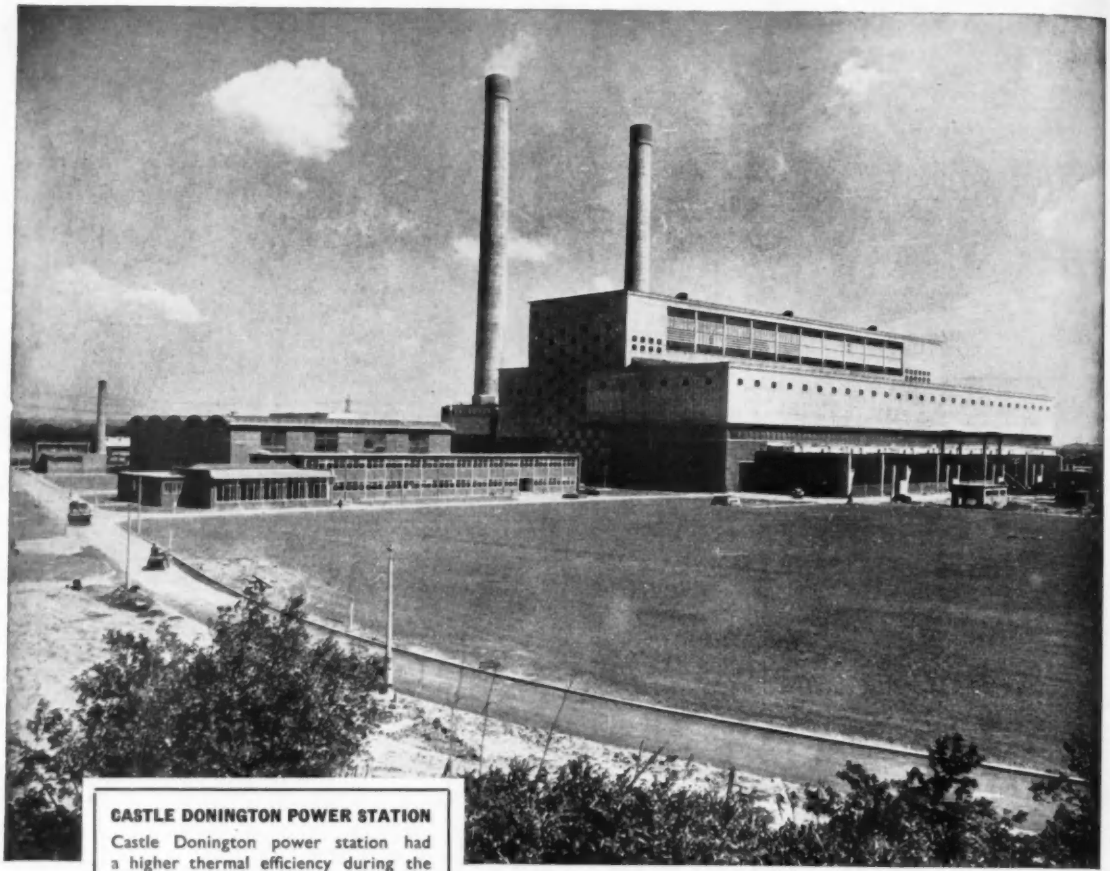
*Sound,* planned *lighting makes your premises look more attractive and increases sales!*

And the Philips Lighting Design Service is ready and waiting to plan the right lighting for *you* — without charge or obligation. So let imaginative lighting sell for you, too — get in touch with the Philips Lighting Design Service either direct or through your electrical contractor.

*For further information and lighting design enquiries contact your local Philips Branch or ring GERrard 7777.*

**PHILIPS ELECTRICAL LTD** *LIGHTING DIVISION*

CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON · W.C.2
(LD3042)

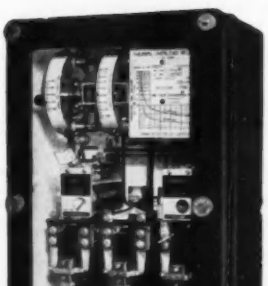


**CASTLE DONINGTON POWER STATION**

Castle Donington power station had a higher thermal efficiency during the year ended 31st Mar., 1958, than any other power station in Great Britain. The motors driving the auxiliaries are protected by P & B Golds relays in this and many other power stations of the Central Electricity Generating Board.

# C·E·G·B chose P&B Golds protection

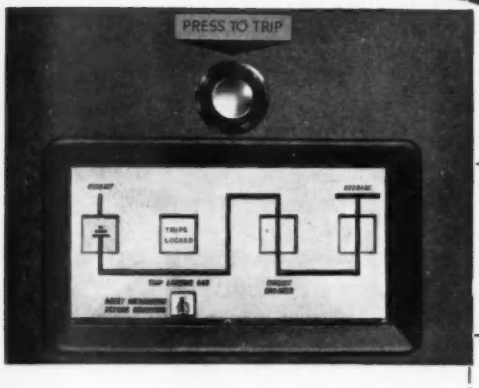
**P & B Relays give full protection for motors with any starting periods or currents under extremes of ambient temperature.**
**P & B Golds Relays protect against phase failure, overload, short circuit or earth fault.**
**P & B Stalling Relays give complete protection against stalling under all conditions. Send for current literature.**



P&B
PROTECTION RELAYS

THE P & B ENGINEERING CO. LTD
CROMPTON WAY
CRAWLEY · SUSSEX
*Telephone Crawley 1004*

# Circuit indication at a glance




## with 'ENGLISH ELECTRIC' type CV oil-break compound insulated switchgear

This latest 'ENGLISH ELECTRIC' design incorporates the well-proved type OLX oil circuit-breaker and complies with the C.E.G.B. and B.S. Specifications. Many noteworthy features have been introduced including a mechanically operated mimic diagram which gives full circuit indication. The unit is available with either manual, manual-charged spring, or solenoid closing mechanisms.

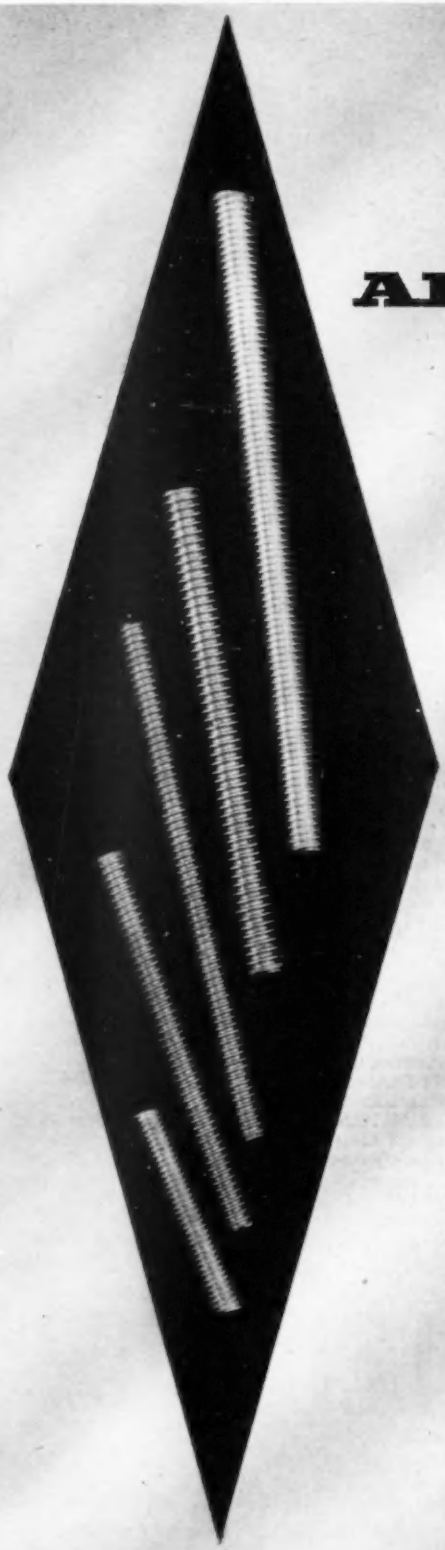
- ★ RATINGS: Service voltages 3·3, 6·6 and 11 kV at 1,200 amp. Busbars up to 1,600 amp.
- ★ BREAKING CAPACITY: 150 MVA at 3·3 kV, 250 MVA at 6·6 and 11 kV.
- ★ EARTHING DEVICE: Single piece with simple positive locking attachment, allowing rapid circuit or busbar earthing.
- ★ SAFETY SHUTTERS: Covering both cable and busbar connection orifices, automatically operated by racking in or out of truck, or can be hand-operated and locked.
- ★ BUSBARS: Pre-drilled unitised type allowing easy extension with minimum shutdown. Compound insulated. Ratings up to 1600 amp.
- ★ CURRENT TRANSFORMERS: Contained in chamber at rear, compound or oil filled.
- ★ AUXILIARY WIRING: Fully accessible even with unit in service. No flexibles. L.T. contacts carried on circuit-breaker moving portion and engaged even with circuit-breaker isolated, allowing full testing to be carried out.
- ★ MAIN CABLES: Sealing boxes of 'split type' allowing cable installation without bending.
- ★ HOUSING: Modern styling, completely free from projections.

# 'ENGLISH ELECTRIC' switchgear

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2
*Switchgear Department, Liverpool*

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

SGL.33



# ALL THREADS

ENGINEERING ORMOND COMPANY LTD

The range, in both Brass and Steel, is from 0.BA to 5 BA and $\frac{5}{16}$ to $\frac{1}{8}$ inch diameter and between $\frac{1}{4}$" and 4" long. Recommended for use within this range, with rolled threads, where studding in these lengths in cut threads would be too expensive. Please send for stock lists.

*The Ormond Engineering Co. Ltd.*

ORMOND HOUSE, ROSEBERY AVENUE, LONDON, E.C.1.

Telephone: TERminus 2888

Telegrams: "Ormondengi, Smith"

Globar
REGD. TRADE MARK

DURABLE DEPENDABLE
DELTA

# Silicon Carbide Electric Furnace Heating Elements by CARBORUNDUM
TRADE MARK

The new DELTA heating element, used by leading furnace builders throughout the country, facilitates exceptionally accurate temperature control, to a maximum of 1550°C. It also offers outstanding economic advantages. It will give you

* *Easier Installation*
* *Cleaner Operation*
* *Cheaper, Easier Maintenance*
* *Increased Efficiency*
* *Longer Service*
* *Greater Safety*

These are the results of more than a quarter-century's unmatched experience. We shall be glad to hear from furnace builders and furnace users who would like full technical details of GLOBAR DELTA elements.

*A GREAT RANGE OF SIZES IS AVAILABLE*

## THE BRITISH RESISTOR CO. LTD.

TRAFFORD PARK, MANCHESTER 17 · TRAFFORD PARK 2381

# PERFECTION in action

Singleness of purpose and years of experience lie behind any apparently effortless performance.

And so it is with springs.

It's taken for granted that Salter Springs will keep on and on, doing their job with smooth precision — indefinitely.

But it has taken nearly two centuries of skill and devotion to achieve so great a reputation for reliability that — ironically enough — the greatest compliment paid to Salter Springs is that you can forget them!

FOR TOP PERFORMANCE — SPECIFY

**SALTER**

THE **ALL - ACTION** SPRINGS

GEO. SALTER & CO. LTD. WEST BROMWICH, ENGLAND.

Established 1760

# 23,000 ELECTRICAL POINTS IN THESE TWO ESTATES

Electrical Contractors
Curtis's 1693, High Street,
Knowle, Warwickshire

Pheasey Estate
Great Barr, Birmingham

Architect and Builder
Henry Boot & Sons (Midlands) Ltd.
Great Barr, Birmingham.

## *Wired throughout with* "VOLEX" CABLES LAMPHOLDERS · CEILING ROSES

School Farm Estate
Sutton Coldfield

Architect and Builder
Compton Bros. Ltd.,
Enfield, Middlesex.

S.C.C.G.
LAMPHOLDER

BATTEN
LAMPHOLDER

CEILING
ROSE

**Volex**

Installations of this type demand a high standard of material. Volex Cables and Electrical Accessories were selected only after very careful consideration because they are known to give effective and trouble-free service.

**Note to Electrical Contractors:**
If you are tendering for competitive installations, our representative in your area would be pleased to give you details of our products.

## VOLEX ELECTRICAL PRODUCTS LTD.

Telephone: PENDLETON 4373. SALFORD 6. Telegrams · VOLEXPROD. Salford 6.

# Now on the job!

*It's new!*
**IT'S BETTER!**
*it's cheaper!*

The photograph shows the newly designed Jackson electrically heated boiler installed in the new Tea Room of The Household Supplies Co. Ltd., at Glasgow Cross.

Following the brilliant success of our 'EP' boiler for the **SMALLER CATERER,** the newly designed 'JACKSON' electric boiler is already gaining an equal reputation with the **LARGER CATERER.** Rush hours, peak hours—never cause alarm. This new 'Jackson' copes quietly and efficiently with the heaviest demands

## Jackson Boilers

FULLERTON PARK, ELLAND ROAD, LEEDS 11. Tel: 76673-7

Showrooms: LONDON (Tel: ABBey 6363), BIRMINGHAM (Tel: Central 2720)
GLASGOW (Tel: Central 3660), MANCHESTER (Tel: Blackfriars 4310)

**To JACKSON BOILERS LTD.** Without obligation:—
Please send details of the 'JACKSON' Electric Boiler for the larger caterer*
Ask your representative to call*

NAME _____

ADDRESS _____

_____

* Delete as necessary

# Switchgear for Oil Refineries

**Reyrolle with their comprehensive manufacturing and testing facilities and their world-wide organisation, are well equipped to supply a wide range of switchgear and control equipment to meet the requirements of modern oil installations from generation to distribution**

*Some of the refineries who are already using Reyrolle switchgear and control-gear*

- CORYTON, GRANGEMOUTH,
- ISLE OF GRAIN, LLANDARCY,
- NORTHWICH, SHELLHAVEN,
- STANLOW, GEELONG,
- KWINANA, SARNIA,
- FRONTIGNAN, L'AVERA, SERIA,
- BOMBAY, VENICE, CARDON,
- MARACAIBO, HAMBURG,
- PERNIS, LAGOS, HAIFA,
- ADEN, IRAN, IRAQ,
- KUWAIT, BAHREIN, BURMA,
- CEYLON, and MALTA.

# Reyrolle

A. REYROLLE & COMPANY LIMITED - HEBBURN - COUNTY DURHAM - ENGLAND

**CJB Services to Industry**

*WHEREVER WE GO...*

*...ELECTRICITY*

**No matter what the plant, the process or the industry—electricity is there, driving the equipment and illuminating the area. The electricity, however, doesn't get there by itself—and that's where we come in. Only the wide experience of an efficient electrical design and installation organisation can assure that electrical motivation and illumination are at the right place, in the right quantity and at the right time.**

**CJB**

*CONSTRUCTORS JOHN BROWN LIMITED*

*CJB HOUSE, EASTBOURNE TERRACE, PADDINGTON, LONDON W.2.*

*Telephone: AMBASSADOR 8080.*
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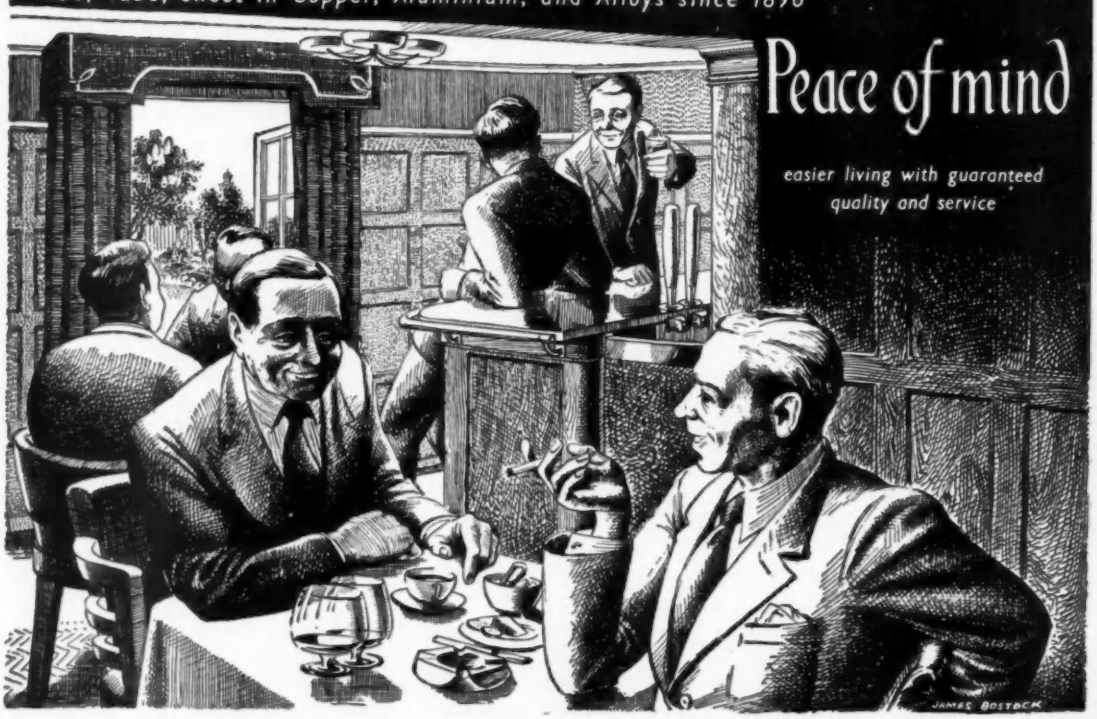
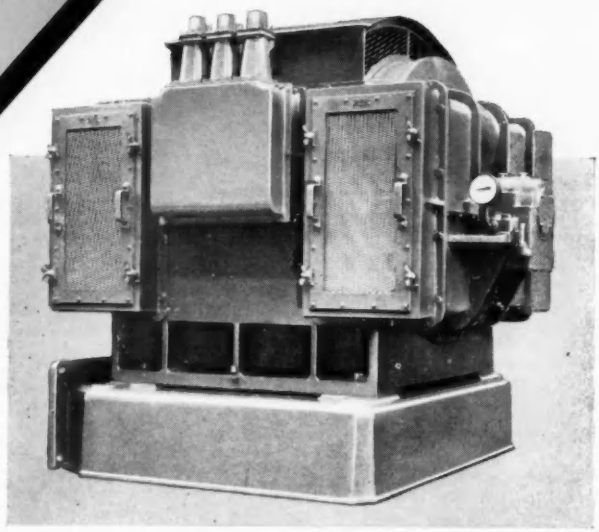
H. ROLLET & Co. Ltd. London, Liverpool, Birmingham, Manchester, Leeds

*Rod, Tube, Sheet in Copper, Aluminium, and Alloys since 1896*



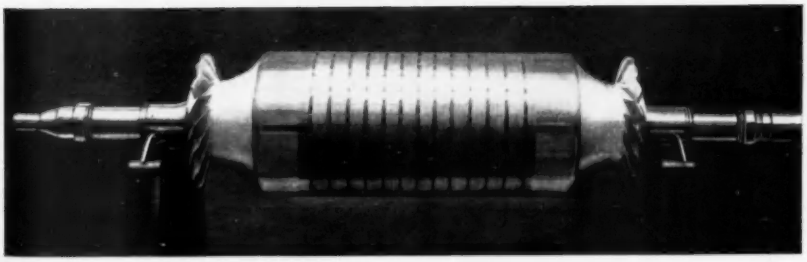
# LARGE SQUIRREL CAGE MOTORS *for* BOILER FEED PUMPS



535 B.H.P. 400-volt, 2960 r.p.m. squirrel cage induction motor fitted self-contained air filters. For driving a boiler feed pump

**BRUCE PEEBLES** squirrel cage motors for driving boiler feed pumps are available in sizes, voltages, and speeds to meet actual requirements. Designs are based on an extensive manufacturing experience and wide knowledge of operating conditions gained over a long period of years.

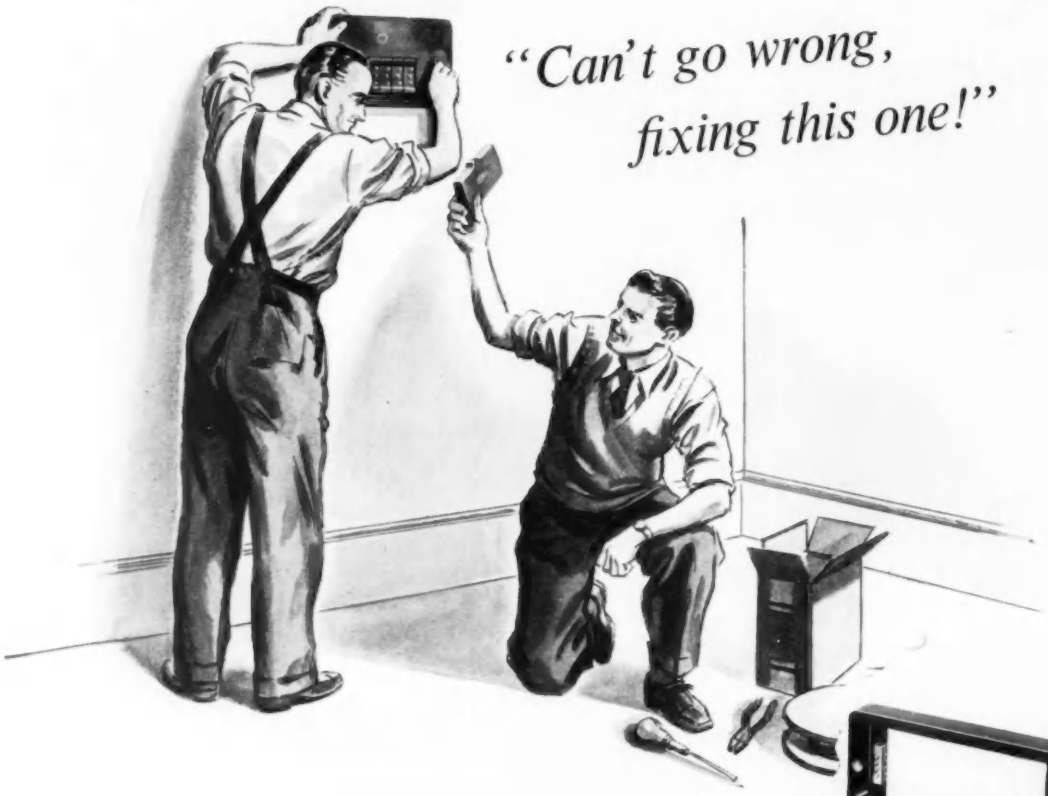
The **EXCLUSIVE KEYED SASH BAR** construction of the rotor ensures freedom from loose windings in service at all times. Well over **250,000** horsepower of motors have been built with this type of rotor. Their record of performance is proof of their reliability.



Squirrel cage rotor for a 2975 r.p.m. induction motor for driving a boiler feed pump

**BRUCE PEEBLES & CO. LTD. EDINBURGH SCOTLAND**

4360



*"Can't go wrong, fixing this one!"*

"It's all straightforward. Plenty of room for everything. It's amazing how much space they've managed to leave, in such a compact Unit. Another thing I like — the fuses are already wired.

I've fitted dozens of these Wylex Units, and I reckon they are the easiest and best I have ever fitted."

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**SWITCH FUSE CONTROL UNITS**

ALL-INSULATED: 1, 2, 3, 4, 6, 8 WAYS
METALCLAD: 3, 4, 6, 8 WAYS

REWIRABLE or H.R.C. Cartridge. 5, 15, 30 amp.

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# Lightweight High Temperature Thermal & Electrical Insulation

REFRASIL is a unique material—
a vitreous silica fibre, light in weight,
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capable of withstanding continuously
temperatures up to 1,000°C
(and even higher for short periods).
REFRASIL has outstanding thermal
insulating characteristics at high
temperatures, as well as being an excellent
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It is available as batt, cloth, tape,
sleeving, bulk fibre, yarn or metal-covered
blankets. It is highly-resistant to
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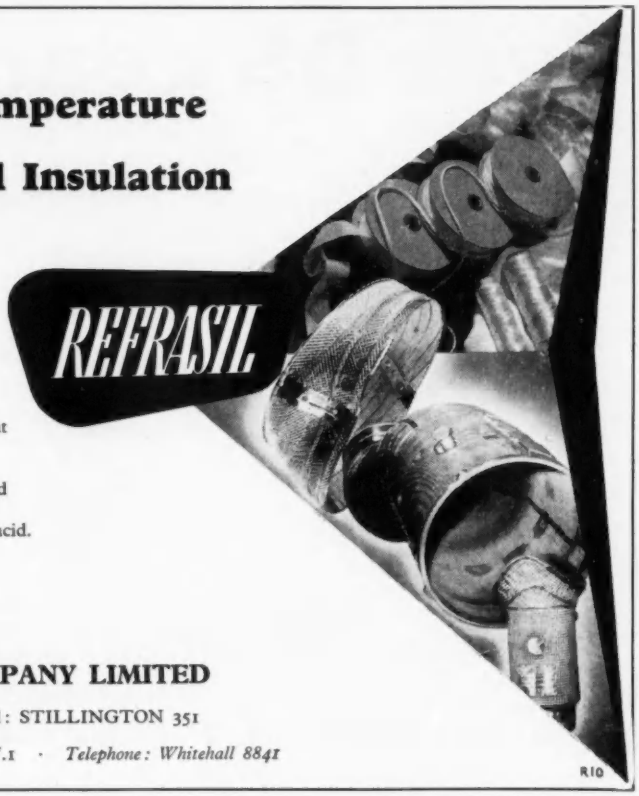


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R10

TUNGSTONE BATTERIES have been selected by British Railways for switchgear operation and supervisory control, in connection with their electrification programmes for the London Midland, Eastern and Scottish Regions.

A total of over 7,000 Cells is being supplied together with the appropriate charging equipment.

These Batteries will be used to provide low voltage D.C. supplies for remote supervisory control circuits; for operating switchgear controlling high voltage A.C. supplies from the National Grid, and switchgear at intermediate points along the lines to be electrified to section electrically the overhead track equipment.

*Photograph by permission of British Railways*

# TUNGSTONE
## BATTERIES

**TUNGSTONE PRODUCTS LTD.,** SALISBURY SQUARE, LONDON, E.C.4. *Telephone:* FLEet Street 8011

*Works:* MARKET HARBOROUGH, LEICS

TC23

# Type DS geared motors

The NECO type DS geared motor is a co-axial straight line drive unit of compact construction with a wide choice of output speeds from 0.5 r.p.m. - 475 r.p.m. and is available for either foot or flange mounting. Motors of 1/6, 1/4, 1/3, & 1/2 h.p. are fitted to the gearbox to provide up to 100 lb.ft output torque.
Motors of all types and voltages can be supplied.

| Standard Final Shaft Speeds in R.P.M. | | | | | |
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| 26 | 28 | 30 | 32 | 35 | 37 |
| 40 | 43 | 46 | 50 | 53 | 57 |
| 59 | 64 | 68 | 73 | 78 | 83 |
| 90 | 97 | 104 | 112 | 120 | 128 |
| 138 | 148 | 159 | 170 | 200 | 215 |
| 230 | 250 | 265 | 280 | 300 | 325 |
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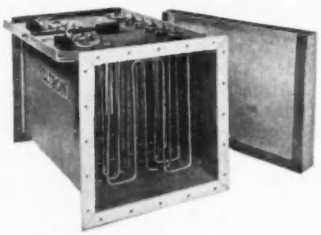
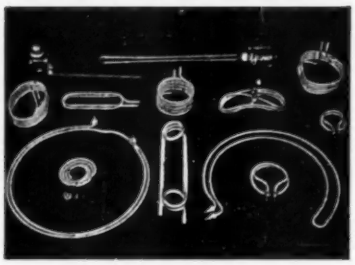


Special ELEMENTS for AIR, OIL and WATER



COMPETITIVE PRICES ● QUICK DELIVERIES ●

Eltron (London) Ltd., Strathmore Road, Croydon
Telephone: Thornton Heath 1861

# Could this be the spring you're looking for?

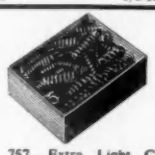
## Then you'll find it down below

Whatever you need in the way of springs you'll find in the range of TERRY'S BOXES OF ASSORTED SPRINGS—compression, expansion, long, short, light, heavy—the lot.

Just the job for you experimental people—a simply unlimited assortment from our tremendous range of springs of every variety. The boxes shown here are only a few examples—why not let us send you our illustrated list showing them *all?*

**No. 760.** 3 doz. Assorted Light Compression Springs. 1" to 4" long, 22 to 18 S.W.G., ¼" to ½" diam. 6/6 each.

**No. 388.** ¼ gross Assorted Small Expansion Springs. ½" to 1¼" long, ¼" to ½" diam., 18G to 21G. 9/6 each.



**No. 757.** Extra Light Compression, 1 gross Assorted, ¼" to ½" diam., ½" to 2¼" long, 27 to 19 S.W.G. 15/- each.

**No. 466.** ¼ gross Assorted Small Expansion Springs ½" to 1¼" long, 3/32" to 3/16" diam., 21G to 24G. 6/6 each.

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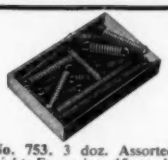
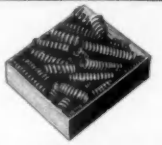


**No. 753.** 3 doz. Assorted Light Expansion ¼" to ½" diam., 2" to 6" long, 22 to 18 S.W.G. 10/6 each.



**No. 98A.** 3 doz. Assorted 1" to 4" long, ½" to ¾" diam., 19G to 15G. 5/6 each.

**Cut production costs with Terry Wire CIRCLIPS**

We can supply from stock in sizes from ⅛" to ½".

**No. 1024.** 20 Compression Springs 12" long, ½" to ½" diam., 24G to 18G, suitable for cutting into shorter lengths; and 30 Expansion 1½" to 12" long, 5/32" to ⅜" diam., 22G to 16G. 24/- each.

★ Interested in Springs? Ninth Edition of "Spring Design & Calculations"—post free 12/6.

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ASSORTED SPRINGS

**Herbert Terry & Sons Ltd, Redditch, Worcs.**

*(Makers of Quality Springs, Wireforms and Presswork for over 100 years)*

*** Have you a Presswork problem?**

If so let us have it and we'll help to solve it for you.

HT 26

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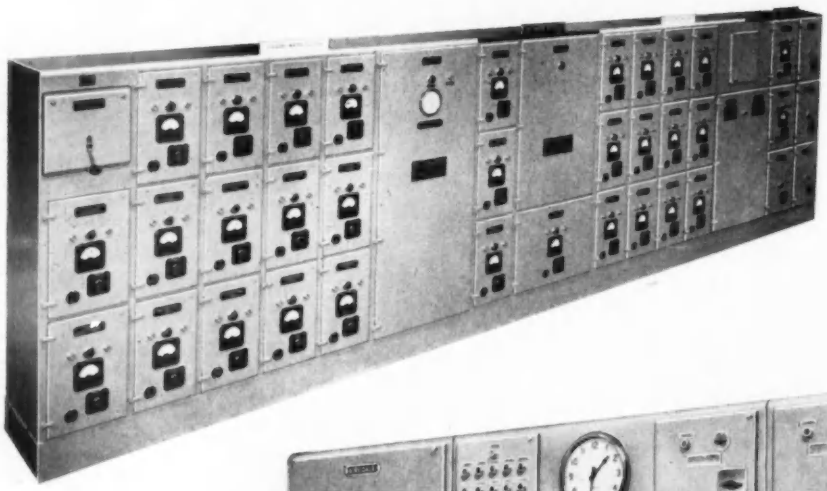
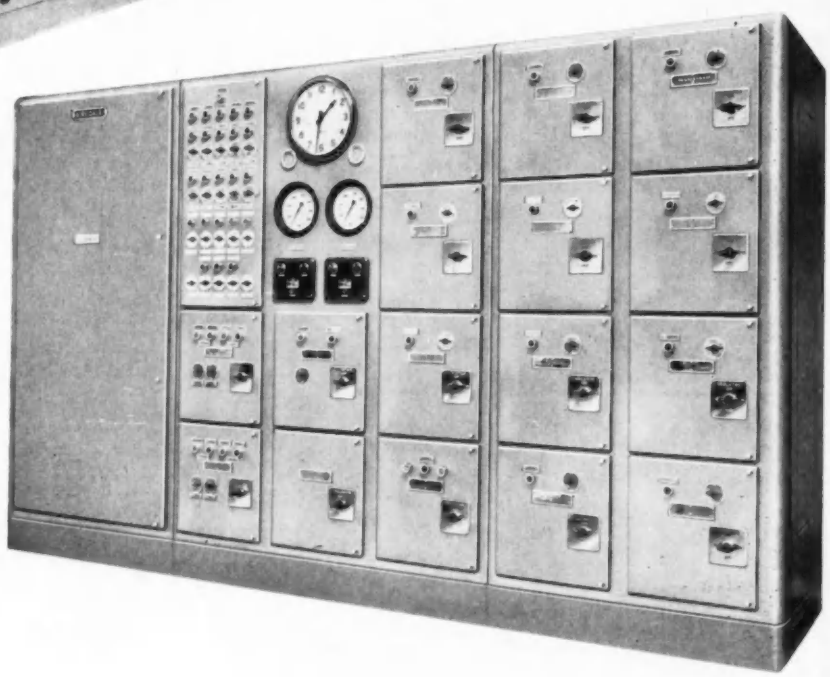
APPERLEY BRIDGE. BRADFORD

LONDON OFFICE TRAFALGAR 3559
225 GRAND BUILDINGS TRAFALGAR SQUARE W.C.2.





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**NALDERS manufacture**

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| Ammeters | Synchroscopes | Vectormeters |
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Graphic Recorders
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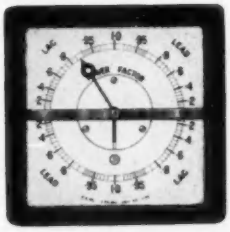
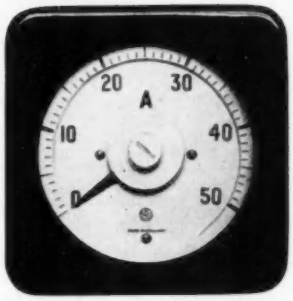
# NALDERS INSTRUMENTS



**. . . with these movements**

Moving iron
Moving coil
Induction
Dynamometer air-cored
Dynamometer iron-cored
Electrostatic




**. . . in these cases**

Round Pressed Steel
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**. . . for these mountings**

Flush
Projecting
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**NALDERS have been making electrical instruments for 75 years.**

**They are all made to the current specifications of the British Standards Institution.**

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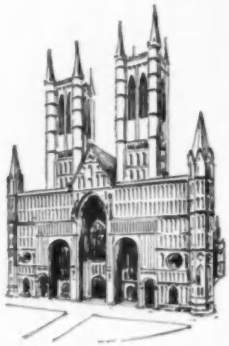

# A Landmark

Like its namesake the cathedral—which can be seen for miles around—this new Santon heater is also something of a landmark; but a landmark for traders not travellers.

Give it a chance and it will guide you to record sales in a highly competitive market—a market in which the traditionally high standards associated with the name of Santon count for a good deal.

## *The* 'LINCOLN' *Thermal Storage* WATER HEATER

This completely new heater combines all Santon's modern manufacturing techniques with the latest 'Stelvetite' abrasion resistant finish. The '*Lincoln*' is, of course, completely automatic, and, due to the studied layout of the heater plate and unions, either right *or* left hand fixing is possible.

***FINISHES:*** White or cream 'Stelvetite' with Guardsman Red Bands. Dresden Blue or Middy Blue Bands can be supplied if requested.

***VOLTAGE RANGES:*** 200/220. 230/250.

***CAPACITY:*** Within 3 pints of 3 gallons.

***LOADINGS:*** 210 V/1530 watts. 240 V/2000 watts.

SANTON

**SANTON LTD.** NEWPORT · MON

*Telephone: Newport 71711*

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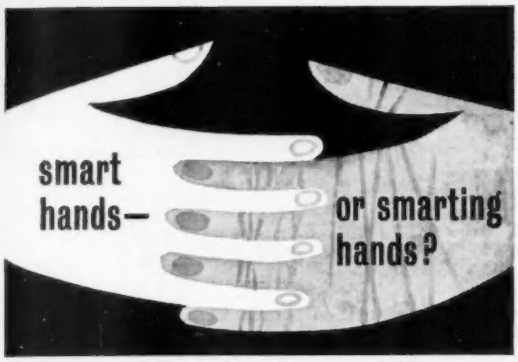


Dermatitis hurts. Both hands *and* production suffer. The difference between smart hands and smarting hands is a Rozalex Barrier Cream. There is a range of these creams to provide protection against almost all known industrial irritants. Rozalex have been specialising in barrier creams for over 30 years. Their full technical resources are available from Rozalex Ltd., 10 Norfolk Street, Manchester 2.

**ROZALEX BARRIER CREAMS** protect

R131A

**J. F. RATCLIFF (METALS) LTD.**

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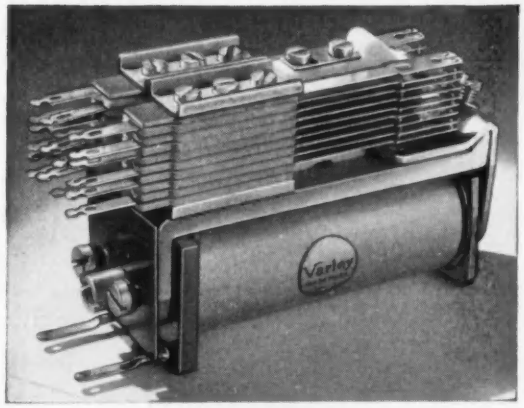
Phone: ASTON CROSS 3576 P.B.X. Grams: "RODENT, B'HAM 19"

# A name that means something!



**Varley**
REGD. TRADE MARK

## P.O.3000 RELAY

***. . . a name that means quality*** All VARLEY relays are built and adjusted to Post Office specification using new piece parts throughout.

***COILS*** All values from .1 to 100 K.ohms can be supplied, also double and sandwich windings.

***CONTACTS***

| TYPE | RATING | MAXIMUM NUMBER |
|---|---|---|
| Light Duty Twin Silver. | 150V. 0.3 amps | 8 M or B 8 C or K |
| Light/Heavy Duty Silver. | 150V. 2.5 amps | 8 M or B 4 C. |
| Light/Heavy Duty Silver. | 250V. 2.5 amps | 4 M or B 2 C. |
| Heavy Duty Elkonite. | 150V. 5 amps | 8 M or B 4 C. |
| Heavy Duty Elkonite. | 250V. 5 amps | 4 M or B 4 C. |

***A name that means promptness.*** Prototype samples can be supplied within 7 days—full production in 2-3 weeks.

*For further details write to Dept. R.1*

**OLIVER PELL CONTROL LIMITED**

Cambridge Row, Burrage Road, Woolwich SE18

*Telephone: WOOlwich 1422 Telegrams: Olipel, London, SE18*

TA2547

Walsall

# News Items

ESTABLISHED 1892

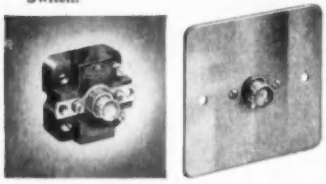
43 SERVICE BRANCHES COVERING THE BRITISH ISLES

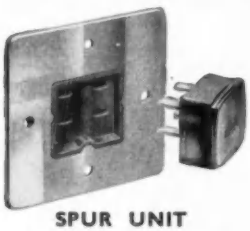
## ★ NEW 'GLOW' BUTTON SWITCH

### GLOW-BUTTON SWITCH

**5 AMP. · A.C. ONLY · 250 VOLT SINGLE POLE - TWO WAY DOUBLE POLE**

"WALSALL" first again with an entirely NEW action switch.
The usual switch dolly is dispensed with and a "Push Button" operation switch, that glows when the controlled light is "OFF", is substituted.
Easily located and operated in the dark —no more finger marks round the switch plate.
The light source is from a long-life Neon bulb which "glows" through a translucent button when the light is off and goes out when the light is on.
Continuous button depressing alternates ON/OFF, reciprocating switch mechanism.
This switch will interchange with any "WALSALL" 5 amp. S/P Tumbler Switch.





**SPUR UNIT**

Unswitched, mounted on ⅓" plate
Suitable for mounting on Square B.S.S. Conduit Box.

**13 AMP 3 PIN SWITCHED SOCKET OUTLET AND NEON PILOT LIGHT**

Mounted on ⅓" plate complete with fused plug. Suitable for mounting on Square B.S.S. Conduit Box.

### Additions to the 'TRIMLINE' Range of IRONCLAD Shallow Assemblies

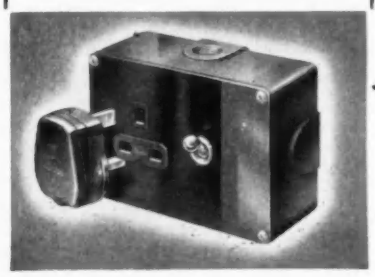
**FOR SURFACE MOUNTING ONLY 13/15 AMP. 250 VOLTS**

Switch assemblies incorporating features similar to the "WALSALL" Shallow range as listed in publication No. SP.51/55, embodying clean flowing lines with rounded corners, and a dished cast iron cover (socket outlet excepted) giving complete protection to the Switch dolly.

### ROBUST A.C. SWITCH SOCKET

**3/13 AMP. SWITCHED SOCKET OUTLETS**

Single base, Tumbler Switch and B.S. Gauge Screen Shuttered Socket Outlet fitted in a cast iron box screwed ¾" conduit. For HORIZONTAL mounting only. The S.P. switch movement is available Q.M.S.B. or Q.M. and Q.B. The Q.M.S.B. is the new rocker type movement specially developed to meet the demand for a robust "A.C. only" switch and supplied as standard unless otherwise specified.



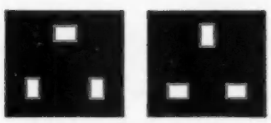
### OFF STANDARD ACCESSORIES

**2/13 AMP. - 3 PIN - FLAT PIN**

To meet the needs of industrial organisations, technical colleges, hospitals, etc., where two different voltages are often used, this range has been developed for isolating an "OFF STANDARD" supply, both from being used by standard voltage appliances and "OFF STANDARD" appliances being plugged into the main supply.

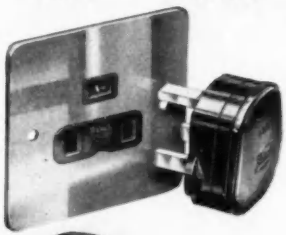
Available only fitted to Brass Face Plates—Plate Suspension.

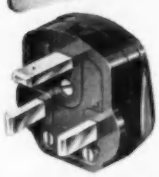
These accessories can be supplied with moulded parts, viz.:—
Socket Pin Shield, Plug Base and Plug Cover in "WALINITE", a tough moulded composition of high impact strength and particularly suitable in workshops, etc.



"WALSALL" OFF STANDARD GAUGE

STANDARD B.S. GAUGE





### STOP PRESS

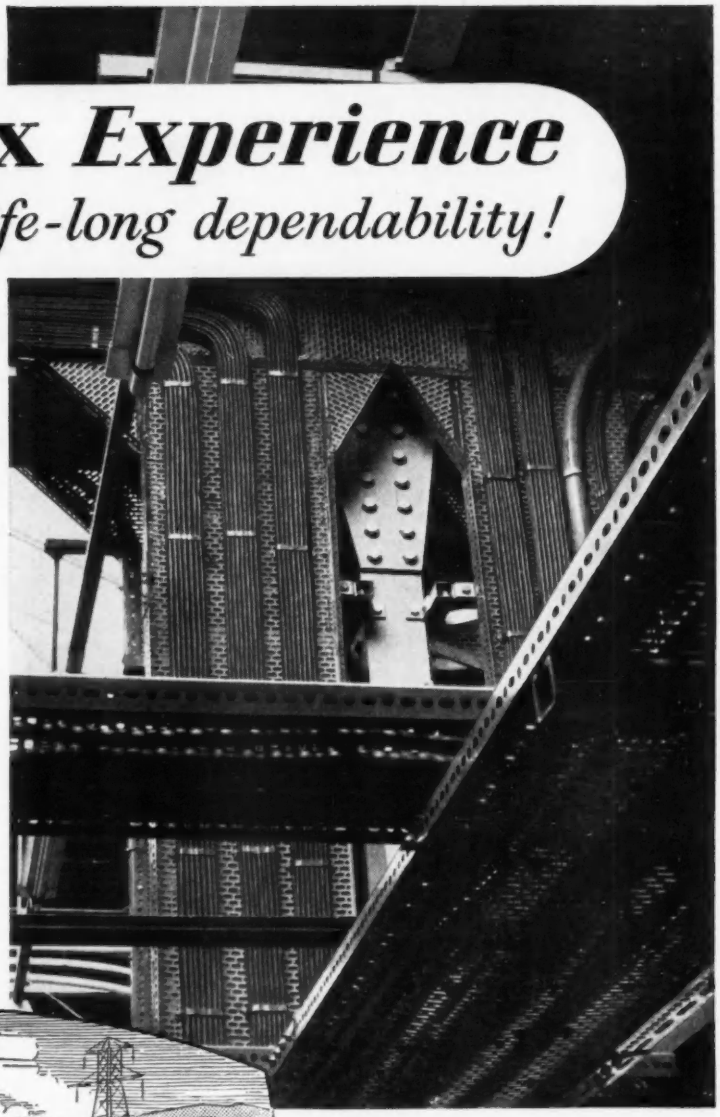
**Further NEW Publications now available Send for your copy.**
**Conduit and Conduit Fittings. Publication No. CF.59.**
**Fluorescent Lighting Fittings. Publication No. F/LF.59.**

**WALSALL CONDUITS LIMITED**

**Excelsior Works · West Bromwich**

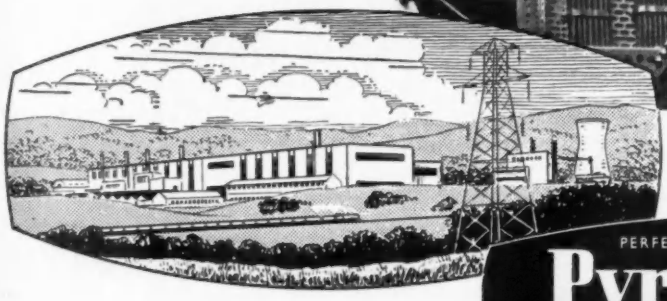
# Pyrotenax *Experience*

## *ensures life-long dependability!*



The unique advantages of 'Pyrotenax' derive from a sound basic idea—mineral insulation, copper covering. Revolutionary 20 years ago, 'Pyrotenax' Cable is today accepted practice where unfailing life-long dependability is demanded. Twenty years and a proving ground that embraces the whole world have produced many problems and found as many solutions. Little wonder that famous concerns the world over rely on the experience behind 'Pyrotenax' M.I.C.C. Cable.

*Write for full details and "Technical Data D118"*



*Photograph, by courtesy of The Steel Company of Wales, showing part of the 'Pyrotenax' installation at the Velindre Works. Electrical Contractors: F. H. Wheeler Ltd. (Cardiff) Consultants: McLellan & Partners Ltd.*

PERFECTED BY EXPERIENCE

**Pyrotenax**

m.i. COPPER COVERED CABLE

***non-fire causing—heat resisting—moisture-proof—non-ageing—rust-proof—safe against overload—resistant to mechanical maltreatment—resistant to noise transmission—***

*The use of the trade mark "Pyrotenax" is exclusive to the products of this Company and its associates.*

PYROTENAX LIMITED

**HEBBURN-ON-TYNE • Telephone: Hebburn 83-2244/8**

## *there is no substitute for experience*

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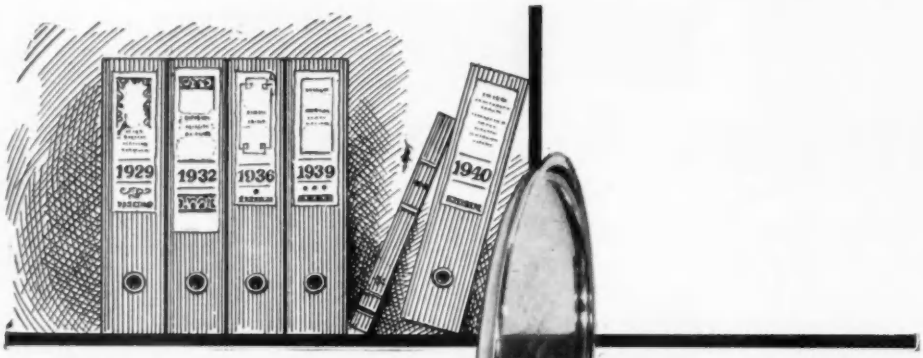
GD118




# It takes years as well as hours...

*Some knowledge can be acquired quickly, some comes only with time: some things can be taught, others must be learned. A great deal of electrical engineering design has been codified. It, too, can be taught; or you can look up what you need in a text book. This kind of knowledge is common property. If it alone sufficed for design, all manufacturers would be able to make identical products: but, of course, it does not.*

## Take A.C. Motors for instance

There is very little room for argument about the basic design principles. In producing a motor to meet a particular specification every manufacturer's designers would, up to a point, proceed in much the same way. But only up to a point. As a design develops, diversity creeps in, for the designers no longer depend on text-book principles alone. They have to make up their minds for themselves; often to choose between alternative courses. How good their decisions are depends on how much they have learned in the course of doing their jobs—on their experience and the fund of experience they can draw on within the firm they work for. Hence, in practice, there are differences between motors designed by different manufacturers for the same duty and that is why a reliable manufacturer's name is so important.

**Crompton Parkinson** LIMITED

***Member of ATOMIC POWER CONSTRUCTIONS LTD.***
*One of the five British nuclear energy groups.*

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ELECTRICAL EQUIPMENT

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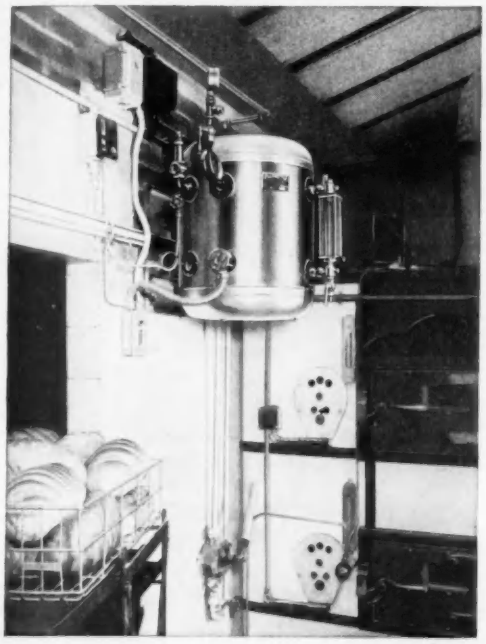
# STEAM ON THE SITE



WE ILLUSTRATE ONE OF NUMEROUS INSTALLATIONS OF OUR

## THERMSPRAY

ELECTRIC STEAM BOILERS

Where Variable Humidity is required

They are compact and have a good performance record covering more than 25 years. No steam wasted.

*Approved by Leading Insurance Companies*

*Manufacturers:*

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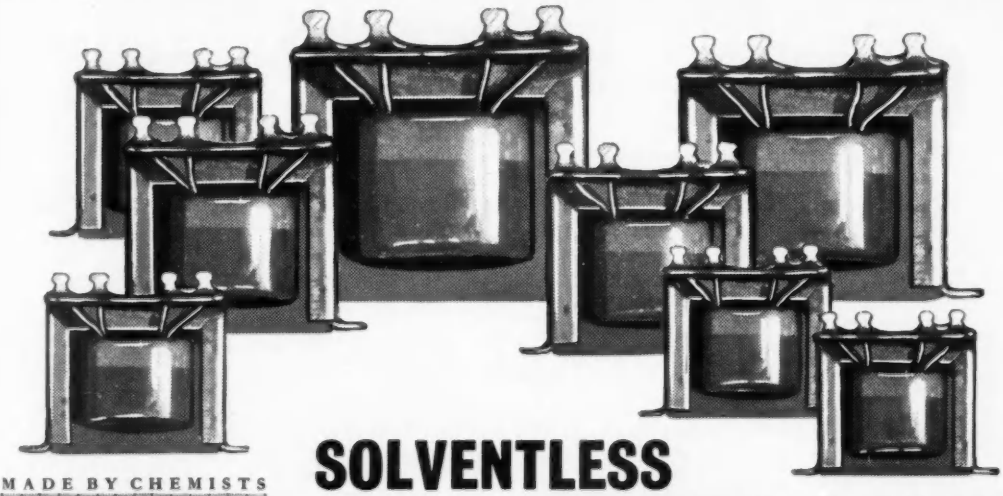
Phone: CANONBURY 3257/58 Grams: "SAFETIMIX, NORDO, LONDON"



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Sterling INSULATING VARNISHES

SERVICED BY ENGINEERS

## SOLVENTLESS *INSULATING VARNISH*

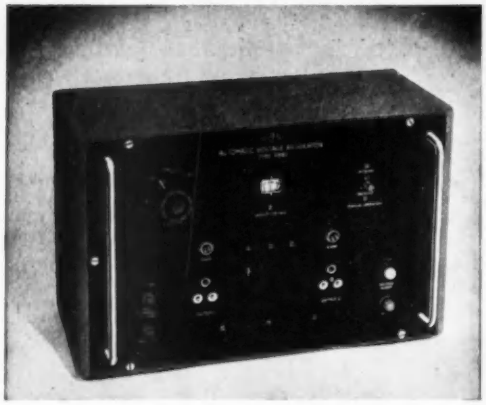
STERLING chemists have produced this solventless insulating varnish with which perfect penetration is assured without recourse to heating. In addition there is extremely low moisture absorption, excellent flexibility and heat ageing, cavitation is minimized and the varnish has a good storage life. STERLING solventless insulating varnish is widely used on transformers, field coils, capacitors, etc. and we should be pleased to give advice on other applications.

**STERLING VARNISH CO. LTD. FRASER ROAD, OLD TRAFFORD, MANCHESER 17.**

***Telephone: Trafford Park 0282 (4 lines)***
***Telegrams. 'Dielectric Manchester'***

***London Office and Warehouse: 6, London Road, Brentford, Middlesex. Tel: Isleworth 8133/4***

dm ST 23



# Voltage Regulation

AIRMEC

## 750 VA AUTOMATIC VOLTAGE REGULATOR

*Type P881*

- Output voltage controlled with ±1%
- Output adjustable between 195 and 260 volts
- Output remains constant over an input range of 80 volts
- Independent of normal variations in frequency, load and load power factor
- 3·2 Amperes continuous load current
- 12 volts per second compensating rate
- Internal and external automatic control and manual control
- Immediate delivery

The equipment consists essentially of an air-cooled type auto-transformer, the ratio of which is varied by means of motor driven brushes. Automatic control is effected by two thyratron operated relays which switch the supplies to the reversible motor, the thyratrons being triggered by a voltage sensitive circuit.
A selector switch allows the output to be controlled either manually or from an external voltage. In the Manual position the automatic control is disconnected and the voltage raised or lowered by means of a spring loaded lever switch. In the External position the equipment may be controlled by a low value external signal to compensate for transformer or rectifier circuits having poor regulation.

Airmec

**VOLTAGE REGULATORS**

AIRMEC LIMITED · HIGH WYCOMBE · BUCKS

*Telephone: High Wycombe 2060*

Birch

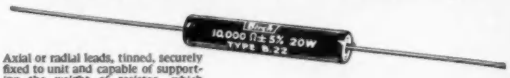
REGISTERED TRADE MARK

## VITREOUS ENAMELLED RESISTORS

**FERRULE END TYPE**
(JOINT SERVICE—TYPE APPROVED)
**9 SIZES—10 to 250 WATT**

Fully vitrified porcelain former, winding 80/20 nickel chrome wire. High rating, liberal safety margin and tolerance.

**WIRE END TYPE. 7 SIZES—1½ to 30 WATT**




Axial or radial leads, tinned, securely fixed to unit and capable of supporting the weight of resistor, which can therefore be soldered into equipment.

*Write for list no. VE 190*

Birch

REGISTERED TRADE MARK

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**WOOD STREET, WILLENHALL, STAFFORDSHIRE**
Telephone WILLENHALL 494 · 495 · Grams WILOHM WILLENHALL
LONDON OFFICE: 1-5 NORTHOLT ROAD, HARROW, MIDDLESEX
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"Colne"

## HEAVY DUTY LIMIT SWITCHES

*Manufactured by*

Colne

**SWITCHGEAR (K & W) LTD.**
*formerly Electrical Products (Colne) Ltd.*
Walton Street, Colne, Lancs.
*Phone: Colne 1394/5*

# SMITHS *for Good Measure*

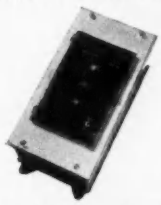
To Industry, the name SMITHS has a world of meaning. It includes a reputation for Good Measure. Good measure in the sense of the long-term accuracy of their industrial instruments, good measure in terms of the service offered by unrivalled research and test facilities. This latter may be said to be immeasurable.

## CALIBRATED RELAY

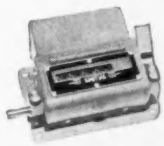
for the Control of Voltage, Current and Speed

Consists of a permanent magnet and coil system similar to that used in a permanent magnet loud speaker, giving high conversion electrical-energy-to-mechanical-force efficiency and, by virtue of the finely-adjustable patent magnetic lock, high precision.

Accurate to ± 1% under static conditions . . . Very low power input (approx. 30 mW) . . . High contact pressure, (15 to 60 grams) . . . Sealed contact compartment with transparent cover . . . Predetermined response time . . . Reliability under vibration and temperature extremes . . . $\frac{1}{8}$" (3 mm) clearance between contacts eliminates possibility of vibration closure . . . Accuracy of setting unaffected by contact wear . . . Automatic reset at approximately 50% of setting current.



**Transistor Batch Counters** for high speed counting and batching of repetitive quantities.

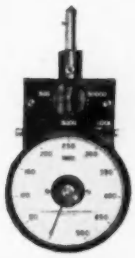


**Predetermined Counters** for counting preset quantities.

**"Petro-flex" Flexible Tubing** for the conveyance of all non-acid fluids.

**Electric Tachometers** a.c., d.c. and Three Phase.

**Synchronous Hours Counters** for indicating life of equipment in a.c. circuits.



**Hand Tachometers** for measuring rotational, linear and surface speeds.

Write for individual leaflets.

**SMITHS** INDUSTRIAL INSTRUMENT DIVISION

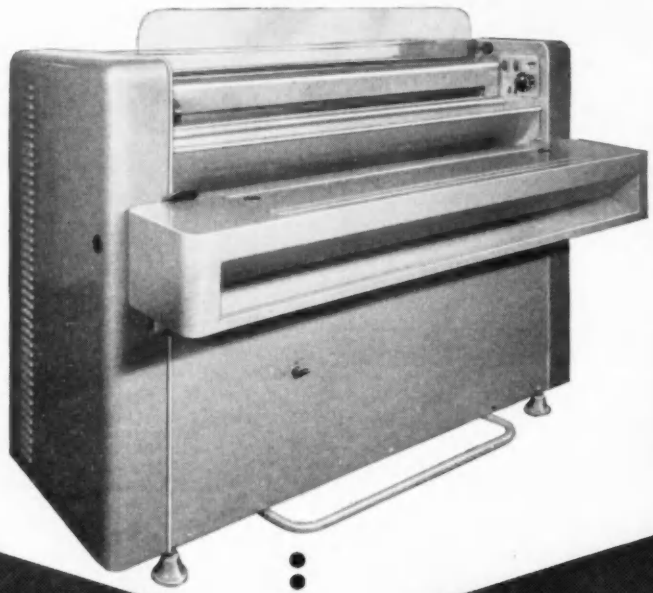
Chronos Works, North Circular Road, London, N.W.2 Telephone: GLAdstone 1136

AP 188/371

# Rapid, high-quality photoprinting

The Ilford AZOFLEX Model 221 Combine printing and developing machine (formerly known as Model 42/63 Mark II) employs safe, odour-free AZOFLEX chemicals—just one of the many special features that make it the ideal photoprinting machine for print room or drawing office.

- Exposing, developing and drying operations completely synchronized.
- All controls accessible from comfortable working position.
- High continuous output easily maintained by one operator.
- Excellent copies obtainable from old or faded originals.
- Comprehensive maintenance service available at nominal cost.



## and no unpleasant fumes

**Capacity: rolls and cut sheets up to 42 in. wide. Printing speed: 6 in. to 15½ ft. per minute. Lamp: H.P.M.V. MA/U 2,000 watt. Dimensions: height 50in., width 67in., depth (tray extended) 52in. Weight: 850 lb.**

*Subject to certain conditions, the majority of AZOFLEX photoprinting machines can be hired as an alternative to outright purchase.*

**ILFORD** *Azoflex*

**PHOTOPRINTING MACHINES & MATERIALS**

*Full details from*
*ILFORD LIMITED, INDUSTRIAL SALES DEPARTMENT AZ17F*
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# new CONDUIT BENDERS

TYPE EL.3A

**The original and most efficient portable outfits made for bending screwing size and open seam conduit.**

## TYPE EL.2A and EL.3A

**CAPACITIES:** EL.2A $\frac{5}{8}$" to 1" screwing and open seam conduit.
EL.3A $\frac{5}{8}$" to 1$\frac{1}{4}$" screwing and open seam conduit.

**FEATURES:**

- ★ Completely portable outfits requiring no fixing or bolting down.
- ★ Fitted with pipe vice for cutting and screwing purposes.
- ★ Fitted with retaining bosses to hold lever in position when Formers are changed and with safety clip to hold lever in upright position when removing bend from machine.
- ★ EL.3A fitted with positive degree of bend quadrant 0° to 180°.
- ★ Adaptable for downward bending (short lengths etc. as illustrated) for upward bending when manipulating long lengths.

FIRST MADE — **HILMOR** — FINEST MADE

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**WRAPPING ELEMENTS**
**STRIP HEATERS**
**TUBULAR HEATERS** *ETC...*

. . . are produced for bread wrapping machines and other sealing machines. Strip heaters for heating platens are available both with mica and ceramic insulation according to operating conditions. Tubular heaters are made with Inconel, stainless steel, copper and other non-ferrous sheaths in diameters from $\frac{1}{16}$" to $\frac{1}{4}$". Your enquiries are invited.

**GENRISTO LTD.**

*The elements of Good Heating*

OSMASTON STREET
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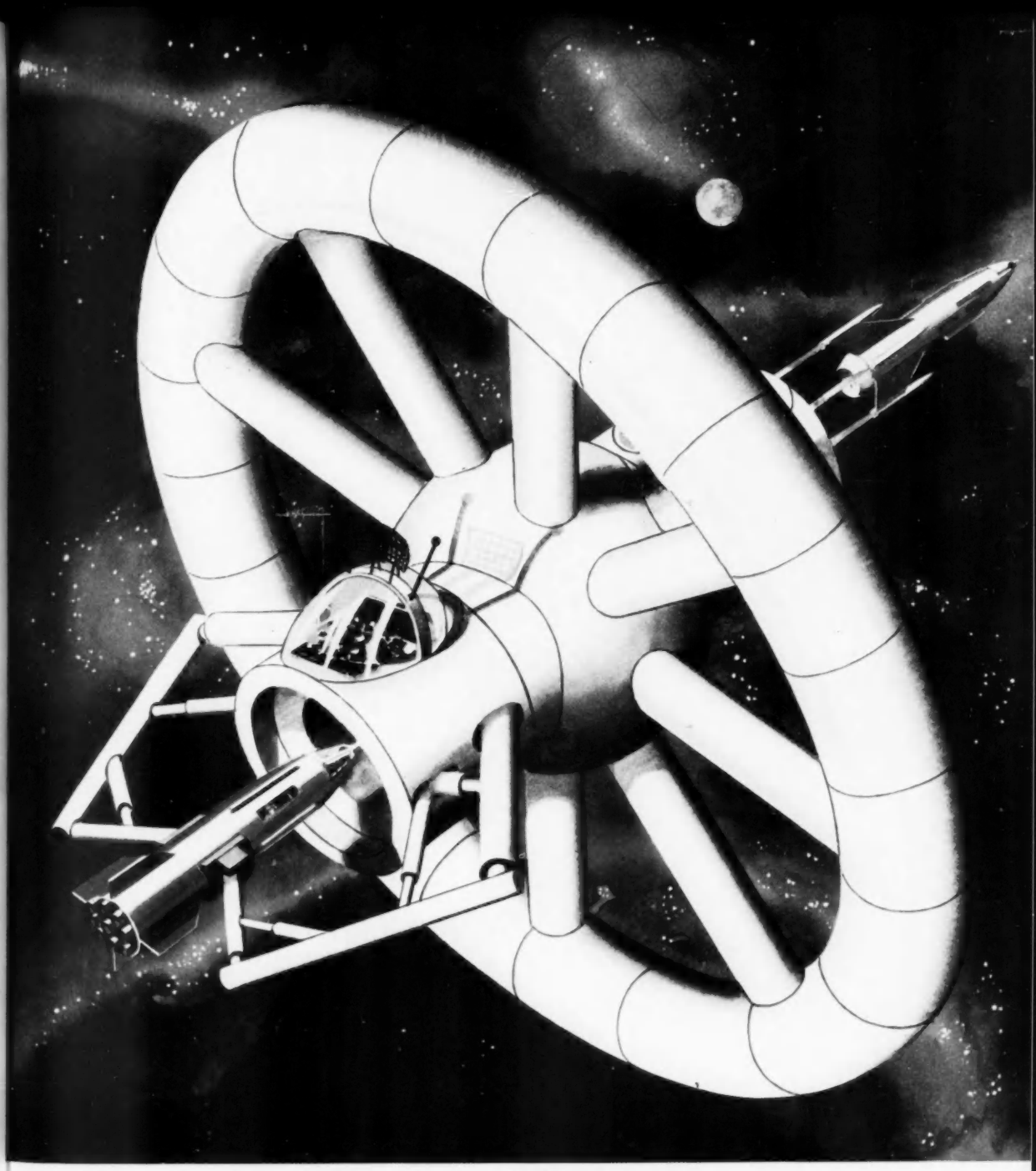

# the 5·13 to Mars

Don't miss the connection!
Rist's Cables ensure complete reliability
in electronic and electrical equipment.
They're certain to be on the 5-13.

RIST'S

## RIST'S WIRES & CABLES LTD.

LOWER MILEHOUSE LANE, NEWCASTLE-UNDER-LYME, STAFFS.
**Sole London Distributors: LYMELITE ELECTRICAL INDUSTRIES LTD**
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# The world's finest-quality connectors

**—IN SUB-MINIATURE, MINIATURE AND PRINTED-CIRCUIT RANGES**

manufactured under licence from
Winchester Electronics Inc., U.S.A.

**GOLD-PLATED CONTACTS**

made from spring-tempered phosphor-bronze
provide
low contact-resistance, prevent corrosion
and facilitate soldering

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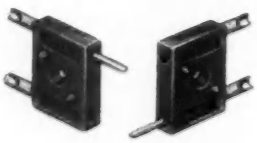
**MINERAL-FILLED MELAMINE MOULDINGS**

provide
high arc-resistance, high dielectric
and mechanical strength

## NOW AVAILABLE



**TYPE D2**

**TWO-POLE STACKABLE CONNECTOR**

★ Alternative contact arrangements ★ Self-polarising stacks
★ 0·3" centres for 0·1" Grid applications

*Catalogues on request:*

**ELECTRO METHODS LTD.,** *Plug and Socket Division*
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Telephone: Stevenage 2110–7

# ELECTRO METHODS LTD
## OF STEVENAGE

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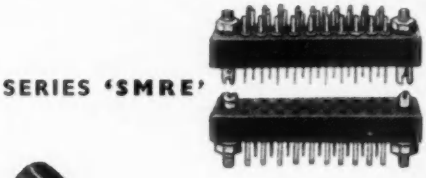
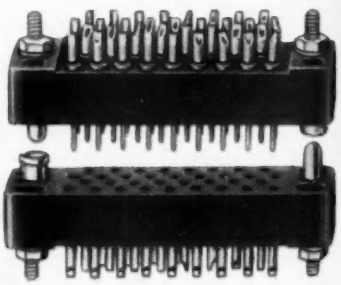
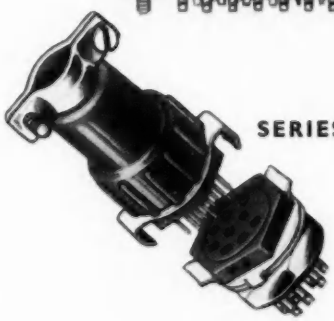


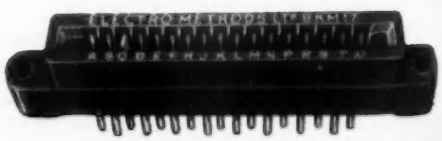
SERIES 'SM'

SERIES 'MRE'



SERIES 'M'





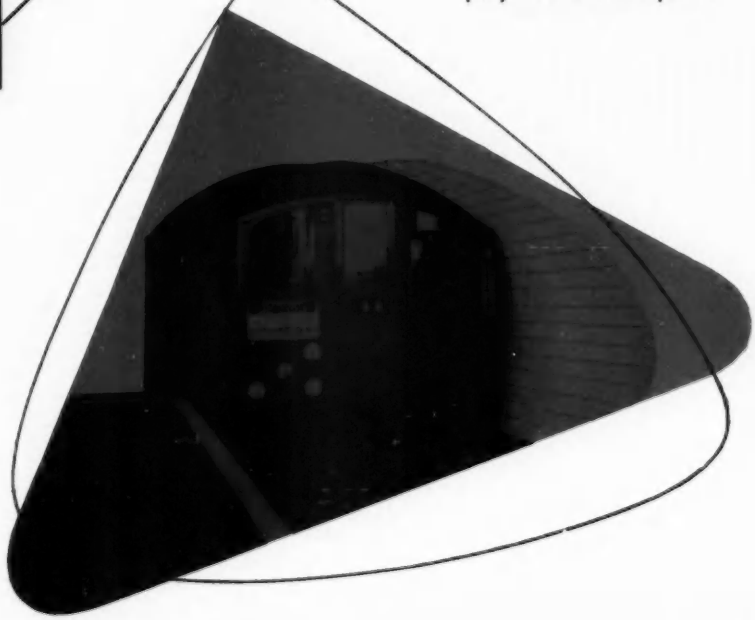
SERIES 'BK', 'BKM', 'K', 'KM', 'KKM'

**above and below ground**

Our insulating materials play their vital part.

**m and i**

**the electrical insulation people**



TOP PHOTO by Courtesy of the C.E.A.
LOWER PHOTO by Courtesy of the London Transport Executive.

**THE MICANITE & INSULATORS CO. LTD., WALTHAMSTOW, LONDON, E.17**
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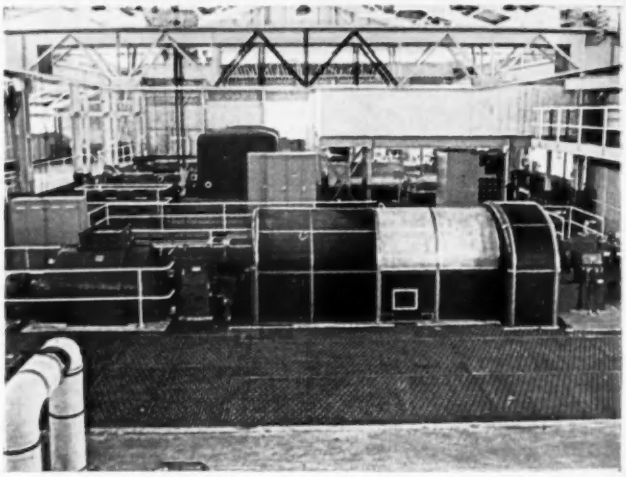
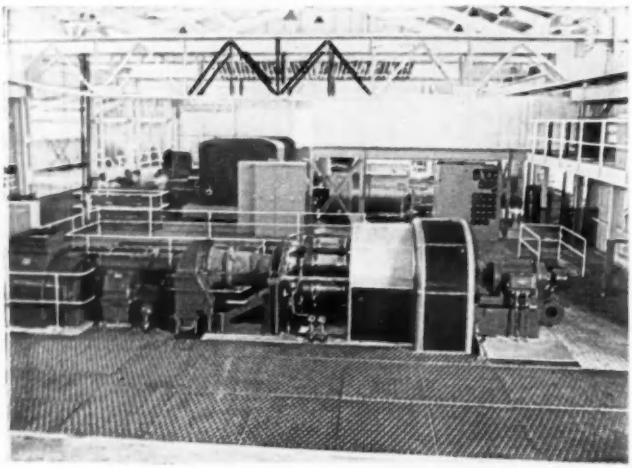
AEI

# 1750 kW GAS TURBINE-GENERATOR



*The gas-turbine with all cleading in place.*

## Over 15200 Hours Base Load Service



*The same unit with part of the cleading removed to show the combustion flame-tubes.*

## IN VENEZUELA

The 1750 kW gas turbine-generator, on base load service in a Shell oilfield near Maracaibo, Venezuela, has completed more than 15,200 hours running on natural gas from the oilfield.

It is a typical example of the Series L axial-flow industrial gas turbines manufactured by A.E.I. Turbine-generator Division for electrical generation and mechanical-drive applications, with ratings between 1750 kW and 22,000 kW.

Units of 4000 kW and 4500 kW are being supplied to oilfields in Iraq and British North Borneo, and a similar machine is being built under licence, in Italy.

## ASSOCIATED ELECTRICAL INDUSTRIES LTD.

**TURBINE-GENERATOR DIVISION**

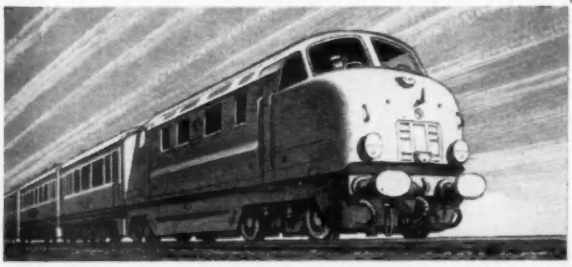
Incorporating the interests of M-V & BTH Manchester and Rugby

WORKS AT MANCHESTER AND RUGBY, ENGLAND · GERMISTON, SCOTLAND · LARNE, NORTHERN IRELAND

BJ/901

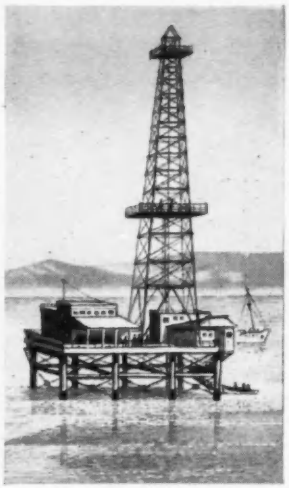
# MAYBACH POWER MADE IN BRITAIN

Typical of the MD range of engines is this Type 650 12 cylinder supercharged model with cylinders arranged in 'V' formation.

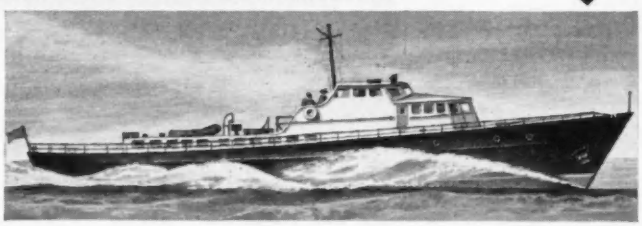


Railway Traction 220-2,000 B.H.P.

Industrial Plant 220-1,750 B.H.P.



Marine 220-3,000 B.H.P.



Bristol Siddeley have the exclusive manufacturing and selling licence in the United Kingdom for the world-famous Maybach MD range of In-line and 'V' form diesel engines. These diesels range from 4-cylinder engines of 220 hp to 16-cylinder engines of 3,000 hp. They have an outstanding record of performance and reliability over millions of miles on railways throughout the world, and are widely used for marine propulsion and industrial power generation of all kinds.

BRISTOL SIDDELEY

**Maybach**

DIESEL ENGINES

**BRISTOL SIDDELEY ENGINES LIMITED**
**Coventry, England**

C

Berry's

BIGGEST EVER

Advertising SUPPORT

# OVER 30 MAGICOAL TV COMMERCIALS IN YOUR ITV AREA!

**Throughout the autumn months — your best Magicoal selling period — there will be over 30 peak-time commercials for Berry's Magicoal fires in every one of the 7 big Independent Television areas. ★**

This great national Magicoal TV campaign starts on September 21st and runs right through to early December. It is Berry's biggest advertising campaign — the best support you've ever had to boost your Magicoal fire sales.

## ITV-VIEWERS are your best customers!

Surveys have shown that ITV-viewers are your biggest customers — they often spend as much as 100% more than non-ITV-viewers on the more expensive items of household equipment. Berry's TV advertising is designed to bring these people to your showrooms in a buying mood. Be ready for them with a good display of Magicoal fires. Order your stocks in good time; they are going to sell faster than ever!

★ *Berry's Magicoal commercials will be seen by more than 23,000,000 ITV-viewers in London, Midlands, Lancashire and Yorkshire, Southern England, Tyne-Tees, Scotland and Wales.*

## Full colour pages too!

Supporting Berry's great Magicoal TV campaign will be bright, eye-catching colour pages in **Ideal Home, Homes and Gardens, Good Housekeeping, John Bull** and **Readers' Digest.** These are the leading magazines in their field, with a total readership of over 16,000,000 people with money to spend on household purchases.

## Free block service Special display material

To help you tie-up with Berry's national Magicoal campaign there are free blocks for you to use in your local press advertising and some special TV display material. Ask your Berry's representative for full details or write direct to Berry's.

**WILL BOOST**

**YOUR MAGICOAL FIRE SALES**

**THIS WINTER!**

**BERRY'S ELECTRIC MAGICOAL LIMITED**
*Touchbutton House, Newman Street, London W1*
*Phone: MUSeum 6800*

Berry's

# Arcolectric

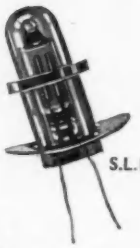
## SWITCHES AND SIGNAL LAMPS

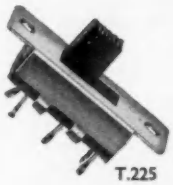
T.225 : Miniature Slide Switch
Self-cleaning contacts
Ideal T.V. mains switch

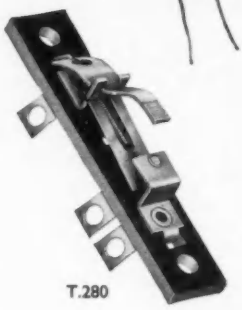
T.280 : Sensitive Snap Action Switch
Contacts of fine silver
Popular switch for tape recorders

S.L.166 : Neon Signal Lamp
The smallest possible low cost
mains indicator for record players

T.626 : Miniature Toggle Switch
Double pole 3-AMP switch
with printed circuit tags


S.L.166


T.225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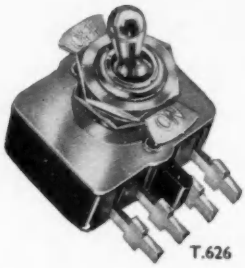
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AT ONCE — WITHOUT CHARGE

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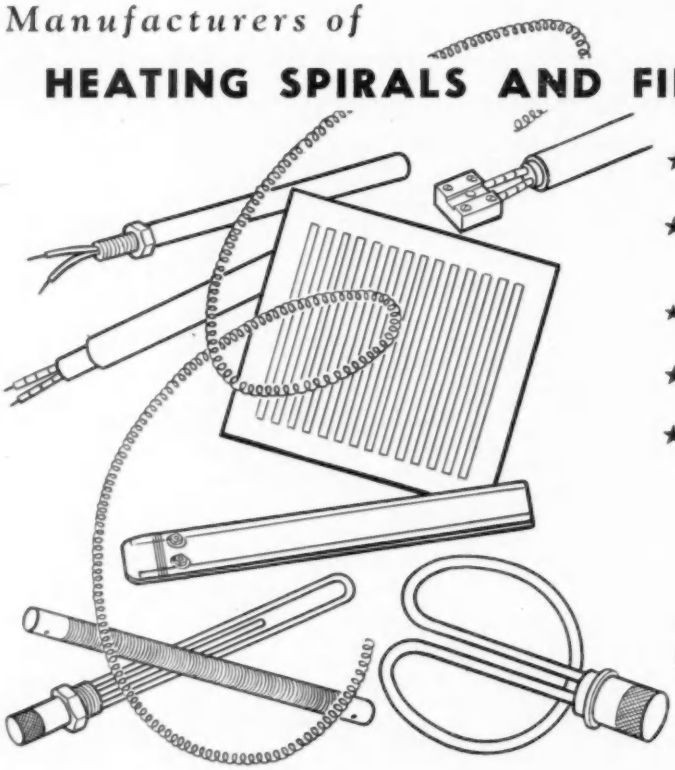

★ SILICA GLASS TUBE ELEMENTS

★ MICA WOUND AND METAL CASED STRIP ELEMENTS

★ CARTRIDGE TYPE ELEMENTS

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★ ASBESTOS WOVEN RESISTANCE MATS AND GRIDS

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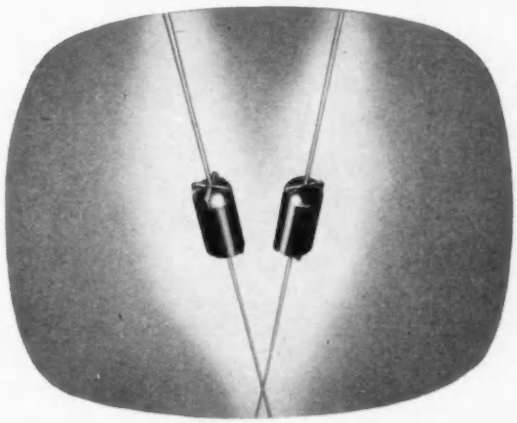
SenTerCel

# SILICON h.t. power rectifier *type FST1/4* for television receivers

The FST1/4 Silicon Power Diode has been specially designed for domestic television receiver H.T. power supplies and is of particular interest to circuit designers planning receivers with 110° scanning, 625 line receivers and colour television receivers. Two diodes may be used in series to provide capacitor smoothed H.T., direct from 250 volts A.C. mains.

*SenTerCel* FST1/4 silicon rectifiers are miniature wire ended devices which can be speedily mounted to tag panels, no heat sink being required. Typical performance curves and design procedure are included in leaflet MF/109.



*Actual Size*

| 400 VOLTS (P.I.V.) | 500 mA UP TO 50°C |
|---|---|

*Important advantages of the FST1/4 silicon rectifiers are:—*

- LARGE POWER OUTPUT FOR SMALL SIZE
- 35 AMPS SURGE CURRENT RATING
- HIGH AMBIENT TEMPERATURE OPERATION
- NO HEAT SINK REQUIRED
- HIGH OUTPUT VOLTAGE
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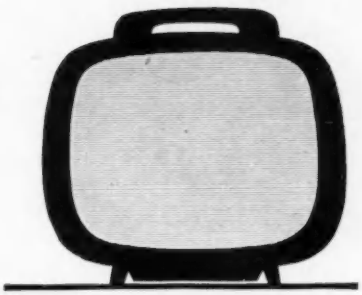

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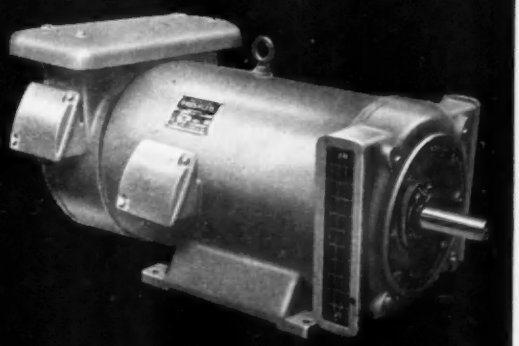

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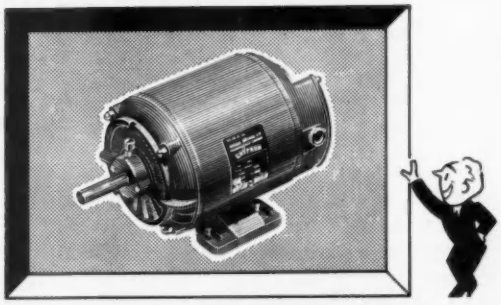

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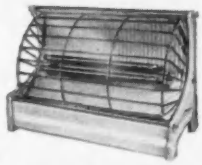

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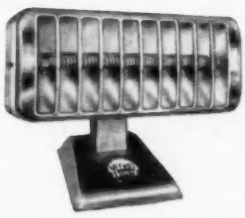

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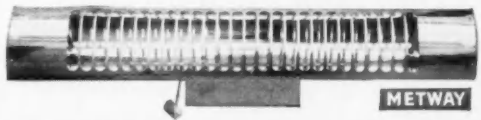


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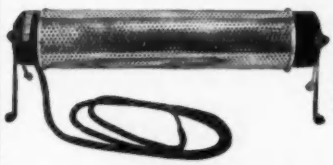

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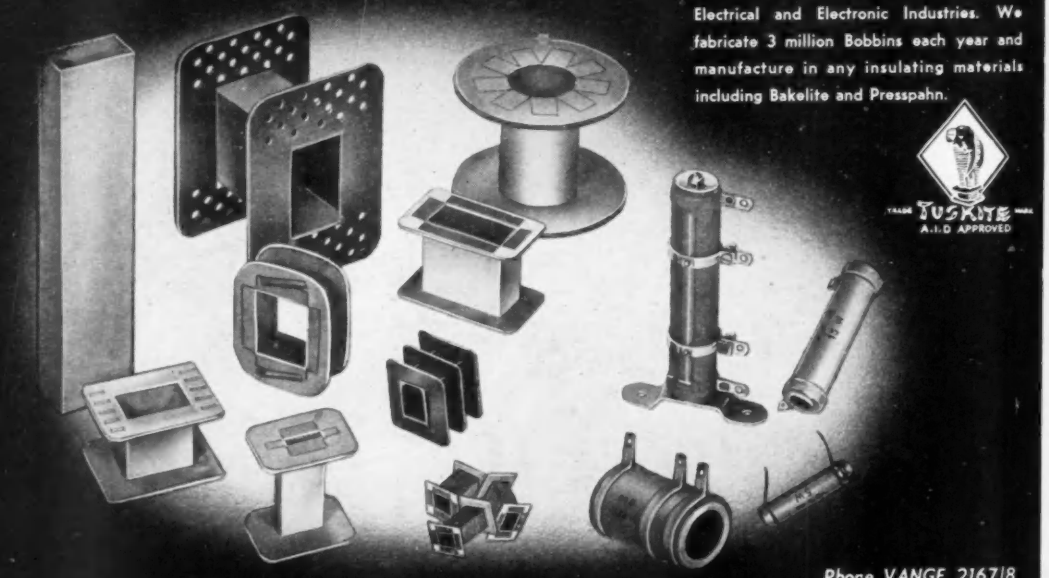


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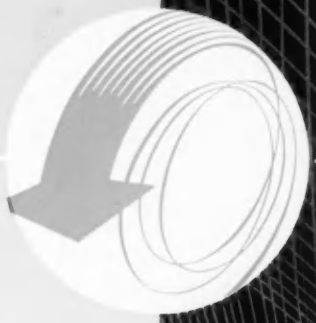
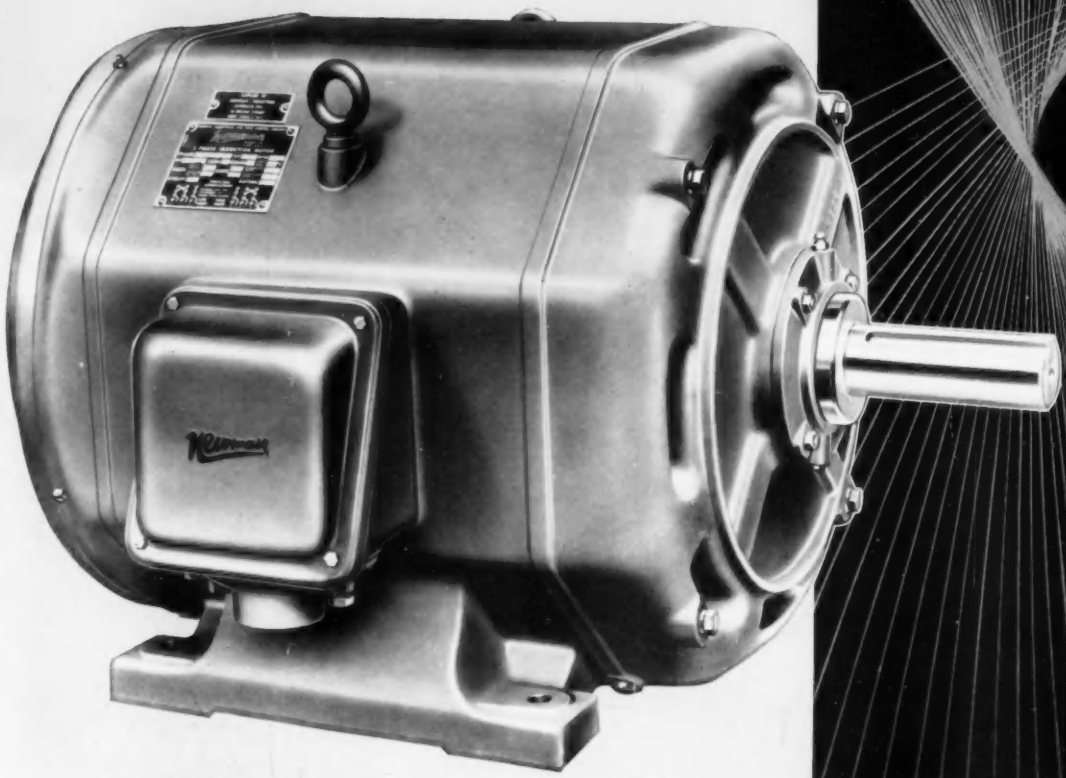


**VENTILATION & COOLING**

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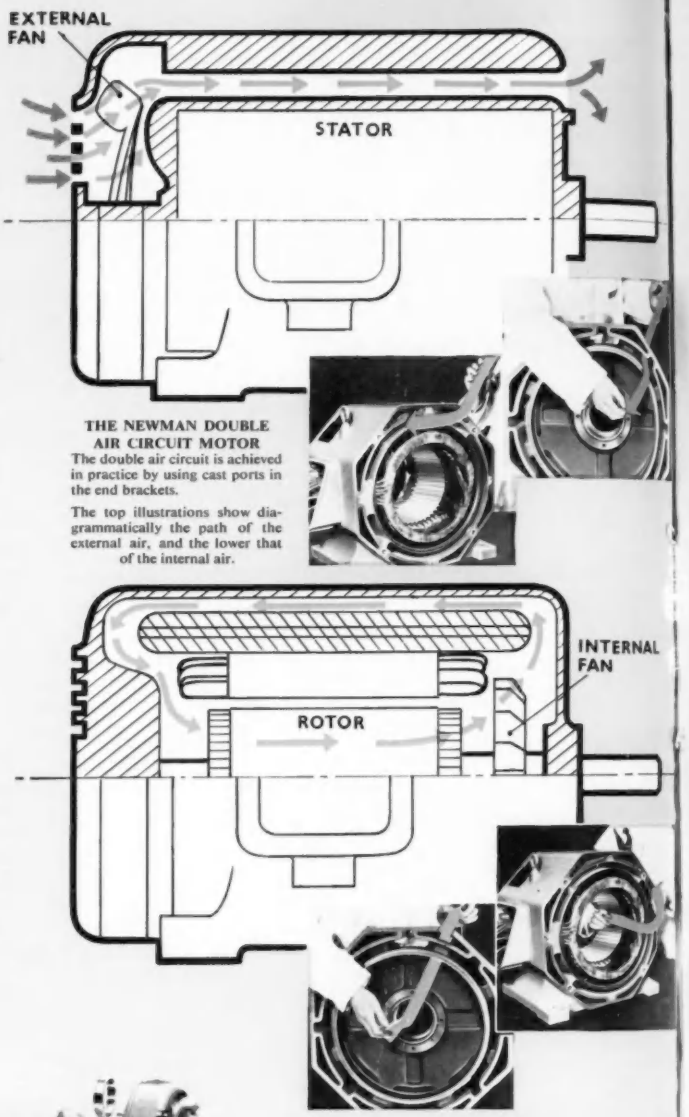
Design of the ventilation and cooling system of an electric motor is of primary importance. On it depend efficient performance, economic production and dimensional compactness.

Obviously the first requisite is that the cooling system shall allow the motor to work at maximum output but at the same time keep the working temperature below the specified BS figure for the particular type of insulation. In addition it must, by virtue of its design, reduce its own 'loss' to a minimum.

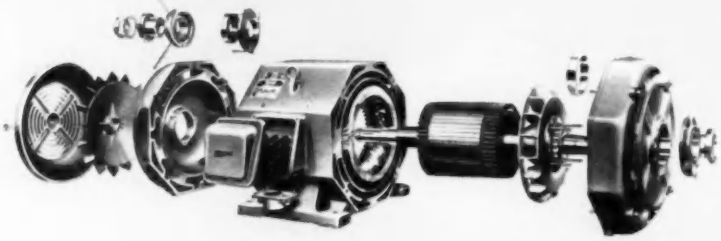
A totally enclosed motor can only be cooled by radiation or convection from the motor casing, without the hot air circulating inside the motor coming into contact with the surrounding atmosphere. Illustrated here is the Newman type JC totally enclosed motor which, by means of a double ventilation circuit, approaches optimum cooling efficiency for this type of motor. The diagrams show how the two completely independent air circuits each with its own fan, are arranged. The cool external air is drawn in at the non-drive end and channelled close to the stator core to draw off maximum heat as it passes. The hot air inside the motor is circulated close to the outside of the stator frame to lose heat rapidly by direct radiation as well as by convection caused by the external air circuit channel underneath.




**THE NEWMAN DOUBLE AIR CIRCUIT MOTOR**

The double air circuit is achieved in practice by using cast ports in the end brackets.

The top illustrations show diagrammatically the path of the external air, and the lower that of the internal air.



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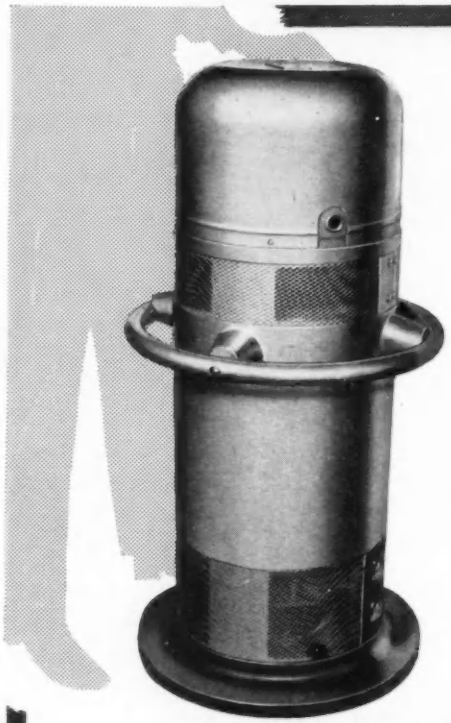

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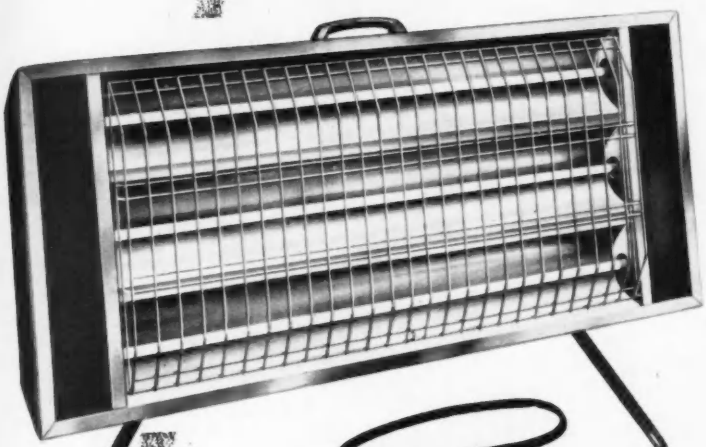

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**Price: £11/16/8** Plus P. Tax **£2/3/3**

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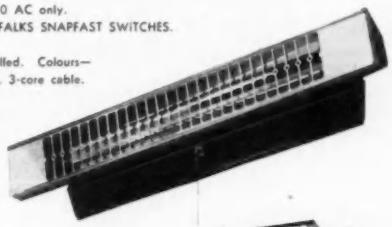

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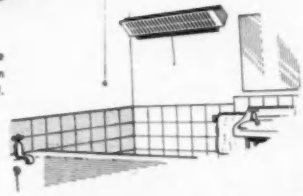

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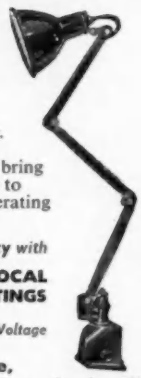
A candle may be better than a searchlight



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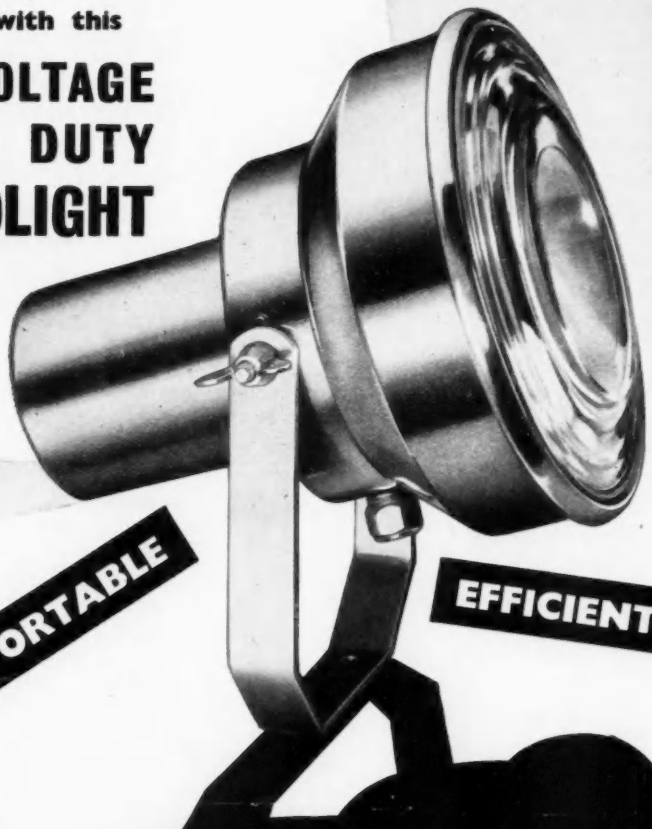

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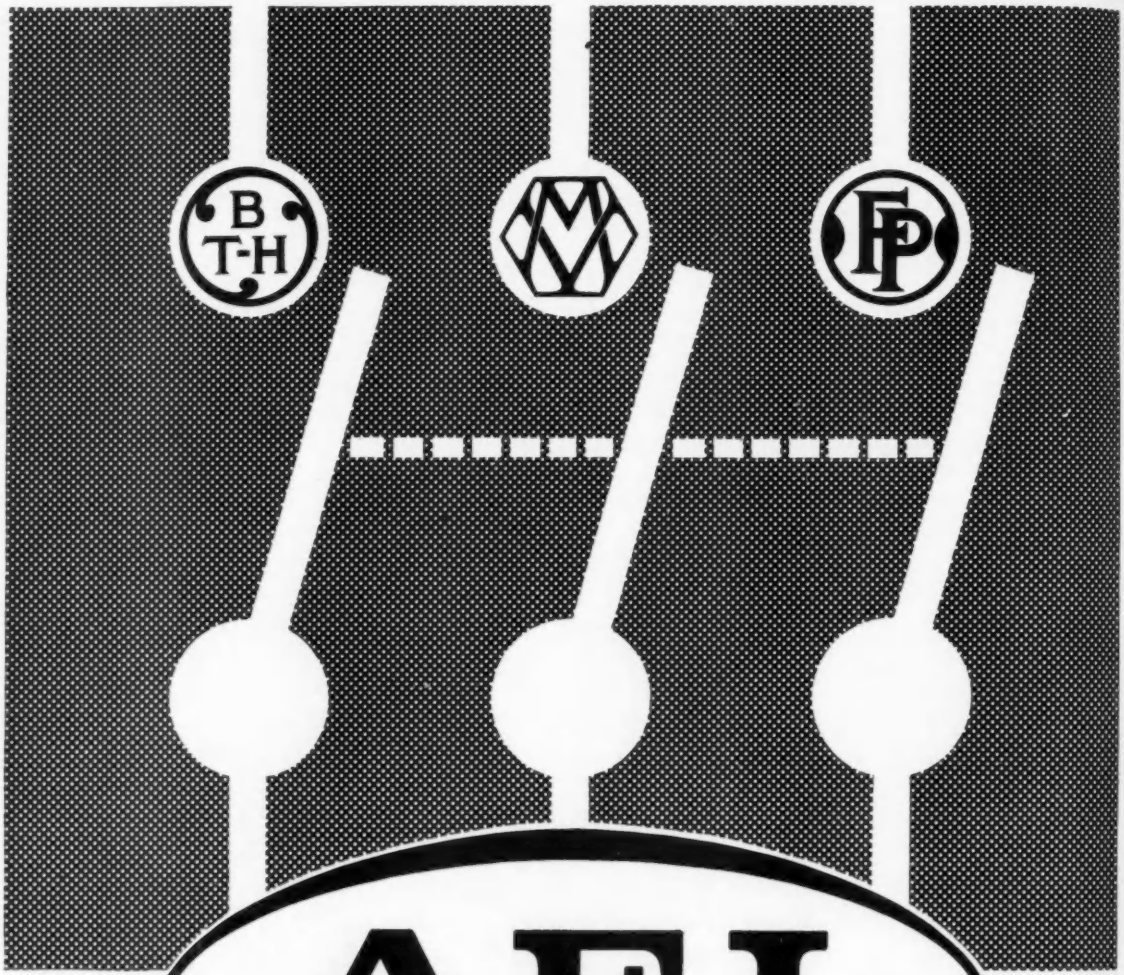


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Pooling of resources, knowledge and experience will bring advantages in design, manufacture, consultation and service.

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This specialised service on Switchgear is available from design, production and sales staff you already know, and who are familiar with your problems.

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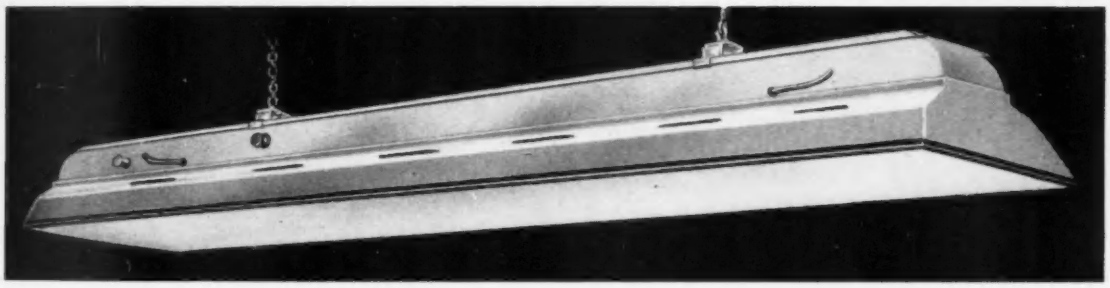
NO DISCOLOURATION WITH AGE

# VITREOUS ENAMEL REFLECTORS have all the advantages



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**Flying Repairs.** Repairs from overseas are not infrequent at the house of Collins. The above photograph shows two rotors, which had just arrived by air from the Middle East, being unpacked. A few days later they were again in B.O.A.C.'s charge on their urgent way back to another satisfied customer.

# COLLINS

*Collins Electrical Ltd.*

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22 *St. Albans Place Upper Street Islington N* 1
*West London Works*
9 *&* 11 *Featherstone Road Southall*
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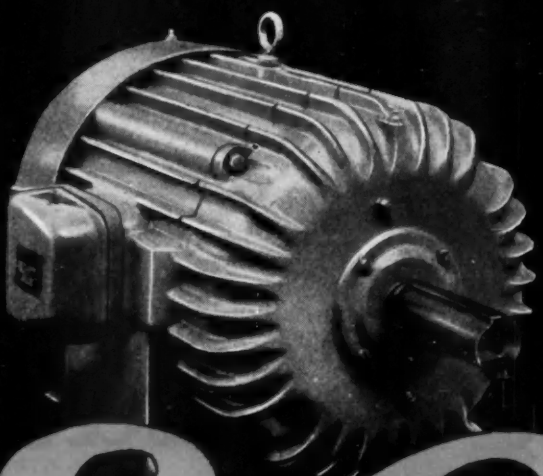
driving

power

of

G.E.C.

industry



Here is the Squirrel Cage Motor with staying power, built for a lifetime of service. It is immediately available from stock in outputs up to 25h.p. Standard dimensions to B.S.2083 (1956). Full details are given in Technical Description No. 431.

THE GENERAL ELECTRIC COMPANY LIMITED OF ENGLAND

HEAD OFFICE: MAGNET HOUSE KINGSWAY LONDON WC2

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# machine wiring made easy

*An A.E.I. Company*

BY APPOINTMENT TO HIS MAJESTY THE QUEEN ELECTRIC CABLE MANUFACTURERS

**W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.**

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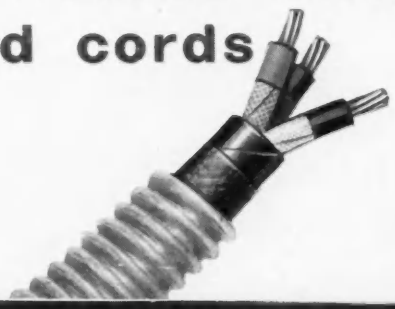
By wiring MACHINES with HENLEY Metallic Flexible Armoured Cable you can have protection from oil, grease and fluids the easy way—and SAVE HALF YOUR LABOUR COSTS* (and think of the ease of making a change when you want to move the machines.)

The armouring is semi-interlocking; won't unravel; is easy to cut and trim. It is normally of galvanised steel, but can also be supplied in Copper Bronze. For special conditions, too, the armouring can be covered with a P.V.C. sheath. It's amazingly versatile, this HENLEY M.F.A. For machine wiring and service droppers it's unbeatable; for long life and trouble-free service the same may be said!

Our booklet "FOR STRENGTH AND FLEXIBILITY" tells you all about this cable. Please send for the booklet, which is free on request.

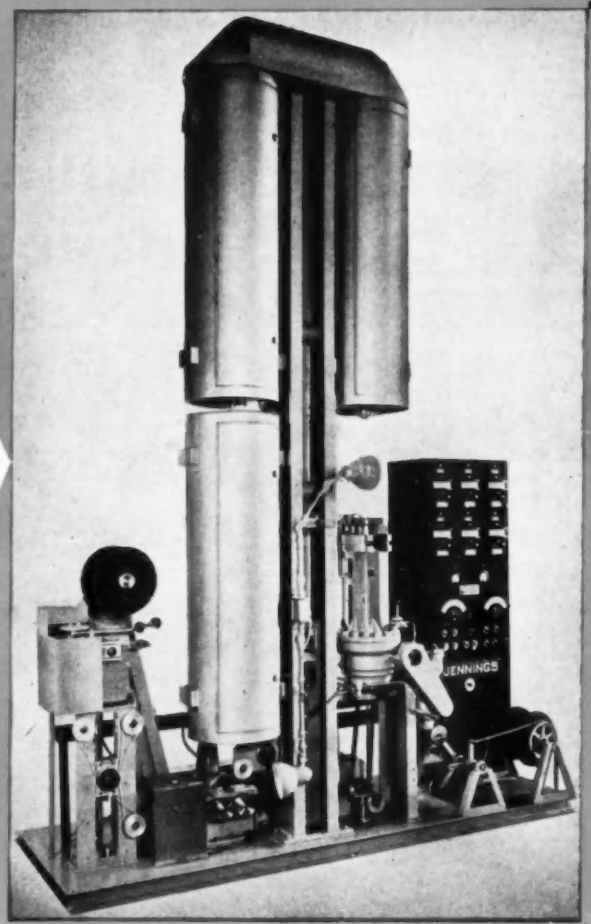
**HENLEY**

**metallic flexible armoured cables and cords**



* *About saving half your labour costs: the illustration shows part of a gigantic machine installed in the Hull works of a famous surgical-dressing maker—Messrs. T. J. Smith & Nephew Ltd. It was wired with* HENLEY *Metallic Flexible Armoured Cables—in* THREE *months instead of the normal* SIX. *Proof.*

# JENNINGS
# P.T.F.E. Extruders




**The TE.1 Fine wire covering Extruder**

The full range of Jennings P.T.F.E. Extruders already well known and commercially proven in the U.S.A. are now being manufactured in the U.K. by special arrangement with Havelock Engineering Ltd., Harlow, Essex. Demonstrations to potential customers are now being arranged. For information please contact :-

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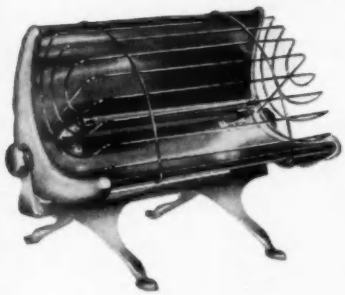
*Polytetrafluoroethylene

# Electric 3 Fires

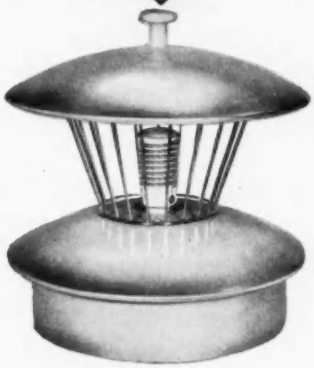
## "PRECENTOR"



THE "PRECENTOR"

This beautiful fire, traditional yet contemporary in design, carries an unusual delicacy of line, particularly in the crescent-shaped end pieces. Small gold coloured knobs adjust the chromium reflector to direct the heat exactly where it is wanted. List Price—1kw **£3.16.0.** 2kw **£4.17.0.** Price including Purchase Tax **£4.9.11** and **£5.14.9.**

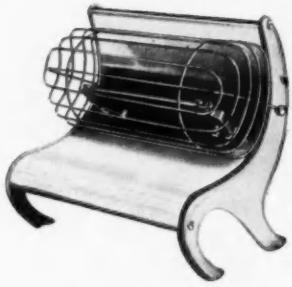
## firebird



THE "FIREBIRD"

In every room this attractively designed electric fire gives all-round-warmth, combining the cheer and glow of a radiant fire with all the benefits of convection heat. Having a unique degree of safety, it is of special value in nursery and sick-room and the subdued glow is ideal when viewing television. List Price—**£2.15.0.** Price including Purchase Tax **£3.5.1.**

## "CURTSEY"



THE "CURTSEY"

Strong and robust in construction, light in weight and easily portable, the elegant lines of the "Curtsey" make it part of any furnishing scheme. The fixed reflector is heavily plated and the safety guard efficient and pleasing in appearance. List Price—1kw **£2.2.6.** 2kw **£3.1.6.** Price including Purchase Tax **£2.10.3** and **£3.12.9.**

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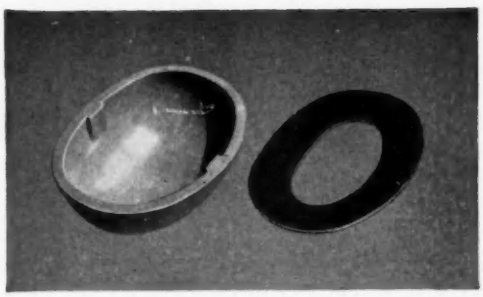
(EE6)

Here's a typical example of how the mechanical strength of Beetle D.M.C. (Dough Moulding Compound) helps to solve industrial problems.

These ear defenders are used to protect the hearing of workers in proximity to jet engines and in noisy factories. During the development work by the makers, Dennis Ferranti Meters Ltd., twelve sets moulded from conventional materials were delivered to Bomber Command for testing. The report of The Central Medical Establishment, Acoustics Laboratory, was that the ear defenders gave excellent protection, but that the mouldings then used were considered too fragile.

D.M.C. mouldings were substituted and have been found virtually indestructible.

D.M.C. is the ideal material whenever high mechanical and/or electrical strength is required. The material can be moulded in conventional compression presses on short cure times and at low pressure. We shall be glad to send full technical details.



*This illustration shows the main moulding from Beetle D.M.C. and a retaining piece made from Scarab material. The Earguards are used in engine testing, rivetting, blasting, rolling mills, weaving sheds, paper mills and on aerodromes.*

B·I·P

**BEETLE MOULDING POWDERS**

**B.I.P. CHEMICALS LTD.,** Oldbury, Birmingham. Telephone: Broadwell 2061.
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Metering as required
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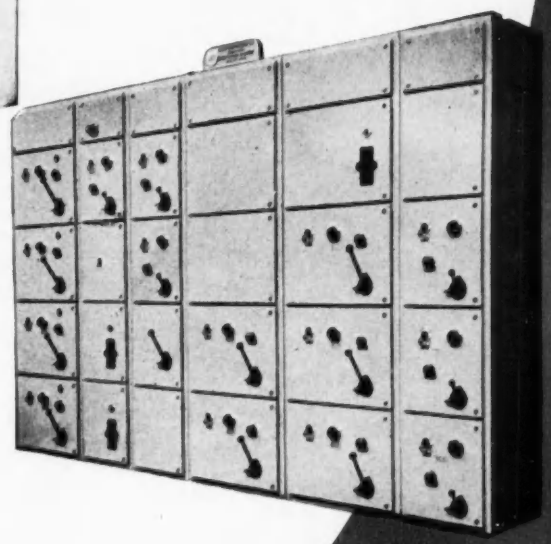

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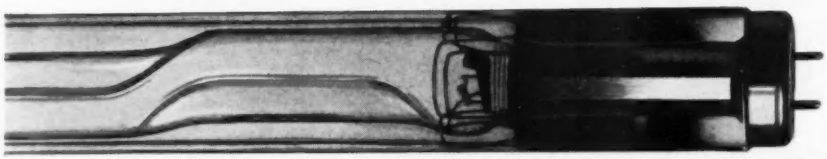
# 100 LUMENS PER WATT

## FIRST IN THE WORLD



# Mazda

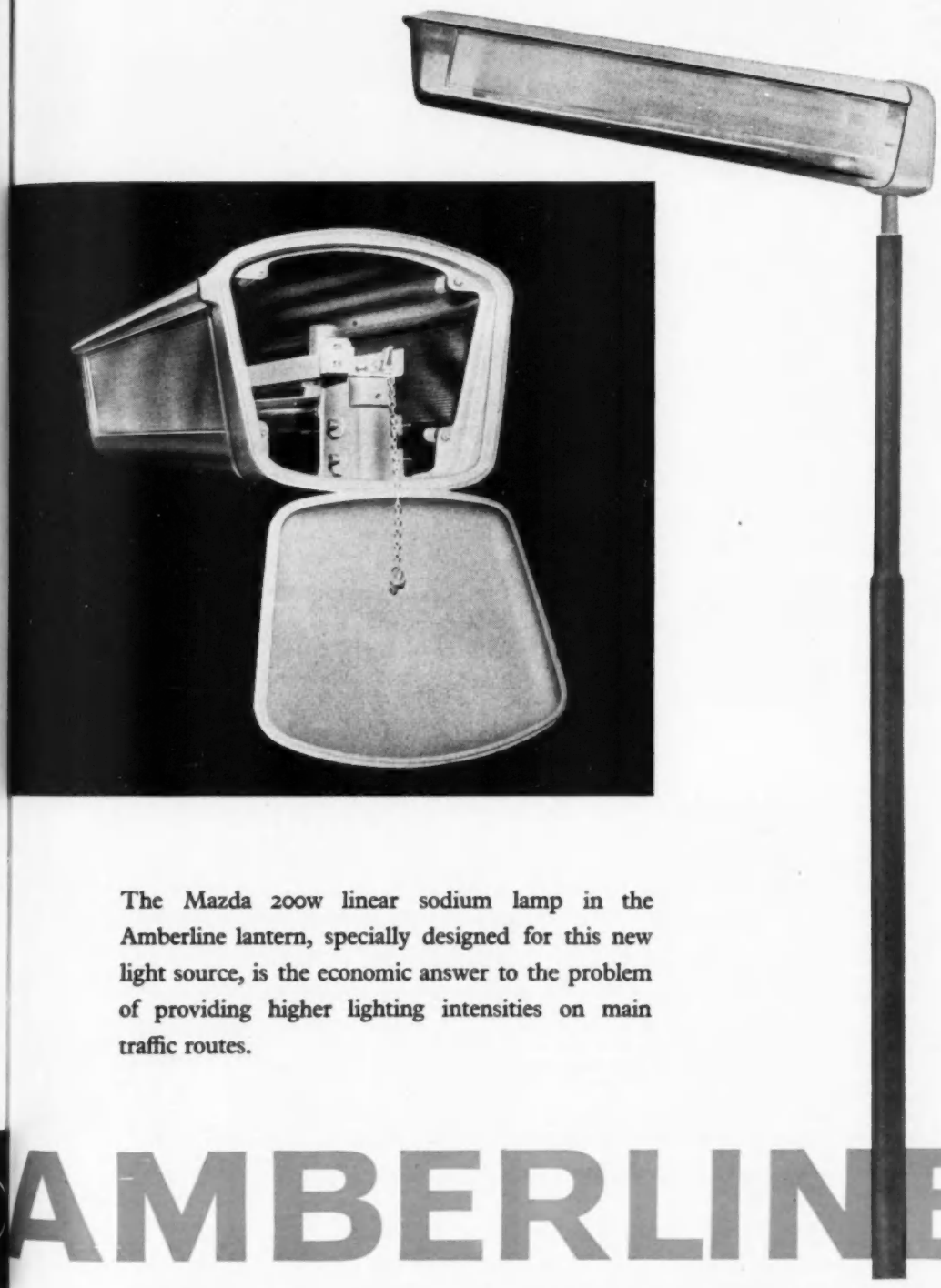
## 200w 3ft. LINEAR SODIUM LAMP

This new Mazda Sodium Lamp, designed from first principles by A.E.I. Lamp & Lighting Co. Ltd., is the first practical lamp in the world to achieve an efficiency of 100 lumens per watt. It is a single line source. The increase in efficiency, about 25% up on previous sodium lamps, is obtained from the design of the ingenious grooved arc tube in which the metallic sodium is retained. The tube is mounted in a $1\frac{1}{2}$" diameter 36" outer tube with bi-pin caps to form a robust and easily handled lamp with a life of approximately 4000 hours.

**A.E.I. LAMP & LIGHTING CO. LTD. MELTON RD. LEICESTER**

AEI
Lamp and Lighting Co Ltd

4824

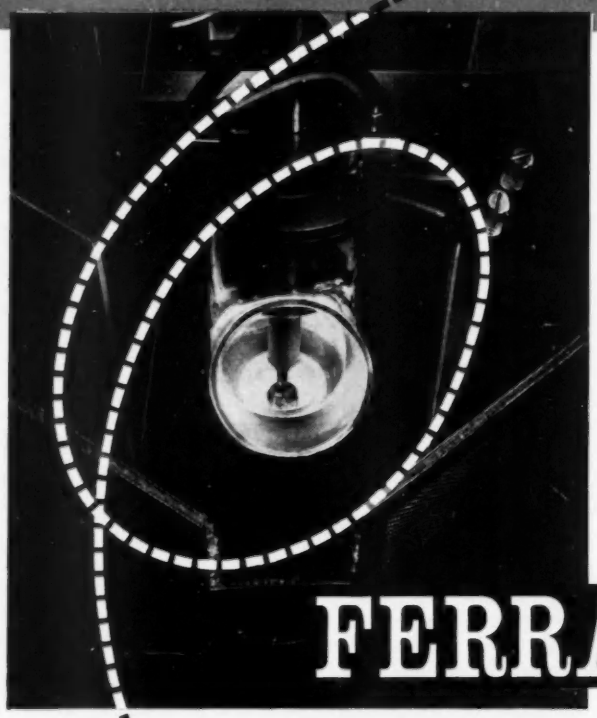


The Mazda 200w linear sodium lamp in the Amberline lantern, specially designed for this new light source, is the economic answer to the problem of providing higher lighting intensities on main traffic routes.

# AMBERLINE

*Introduces new possibilities in street lighting*

*The heart of the matter... the art of the matter*



The formation of a single silicon crystal ingot

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Ferranti Ltd. were the first company in Britain to introduce Silicon semiconductor devices as used in magnetic amplifiers, in aircraft, guided missiles, radar and computers. Until recently they were the only firm in the United Kingdom supplying silicon diodes in quantity. Commencing their programme of research and development in 1954, they have already made outstanding contributions to technique, and are now producing at Gem Mill, Oldham well over half-a-million silicon diodes annually in the widest range offered by any British manufacturer.

Among the 120 or more different devices are rectifiers, fast diodes, zener diodes, tetra-layer diodes and triodes, alloy junction transistors, diffused junction transistors, photo-voltaic cells, voltage variable capacitors and many new ones.

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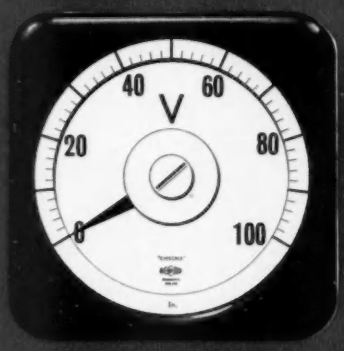


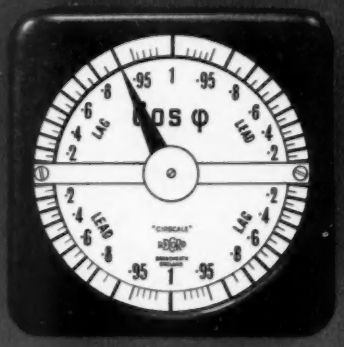


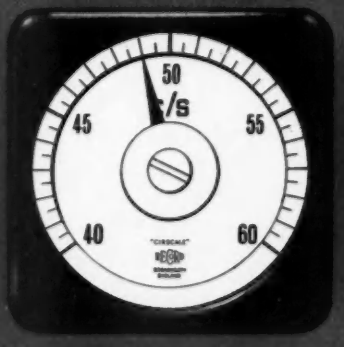


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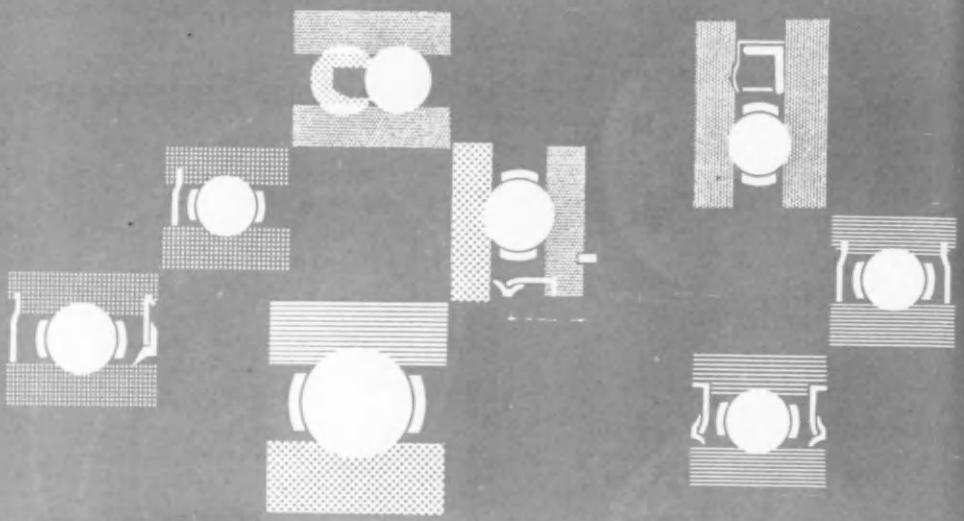

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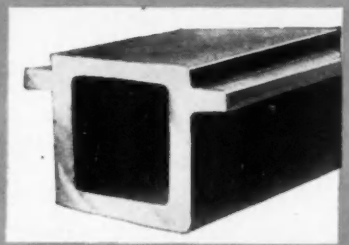
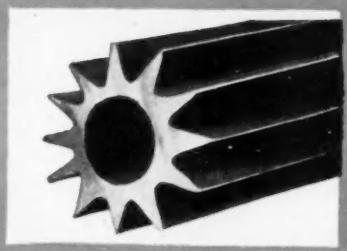
"and he said (that's the Managing Director) 'we must cut down on machining costs, Jones' (that's me) so I said well, why not use

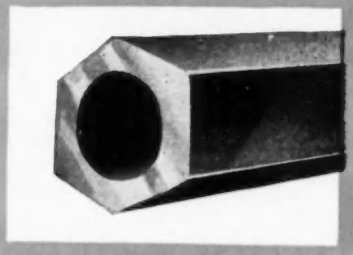
# STEEL EXTRUSIONS

Then he said 'do you mean those things made by Low Moor?' . . . and I said yes . . . and he asked me how they would help machining costs, so I told him, and he simply said 'by jove, we'll ring them straight away'".





*Extruded sections by Low Moor Fine Steels Limited, in all grades of Steel, present many advantages from the point of view of economy and productivity. They make it possible to reduce machining, assembly, and welding costs. Send for further details.*



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*...With the compliments of*

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By designing for Araldite, South Wales Switchgear Ltd. have provided adequate protection for this 3-phase voltage transformer without the use of oil. The coils and insulators form a single casting of Araldite B, simple in design and easy to manufacture. Araldite casting resins do not shrink on setting, and are thereafter unaffected by very wide changes of temperature and humidity. Their properties also include remarkable adhesion to metals, ceramics, etc., high mechanical strength, freedom from chemical action and excellent dielectric properties.

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*Araldite epoxy resins are used*

- for casting high grade solid insulation
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- for producing glass fibre laminates
- for producing patterns, models, jigs and tools
- as fillers for sheet metal work
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# Lec Refrigeration

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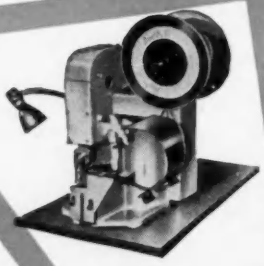
## * FASTON receptacles



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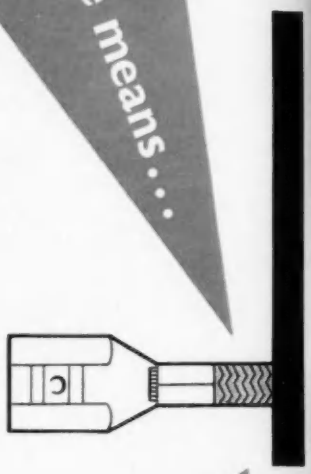

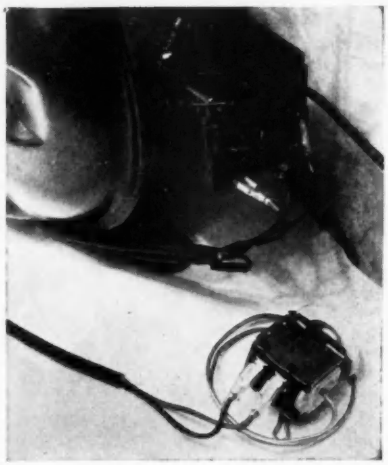

*Faston* Terminals utilised to make power connection to the Lec hermetic sealed unit used in domestic refrigerators throughout the world.*

*Lec's popular 6 cu. ft. refrigerator. With acknowledgements to Messrs. Lec Refrigeration Ltd.*

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page 1

# MS SILICONES

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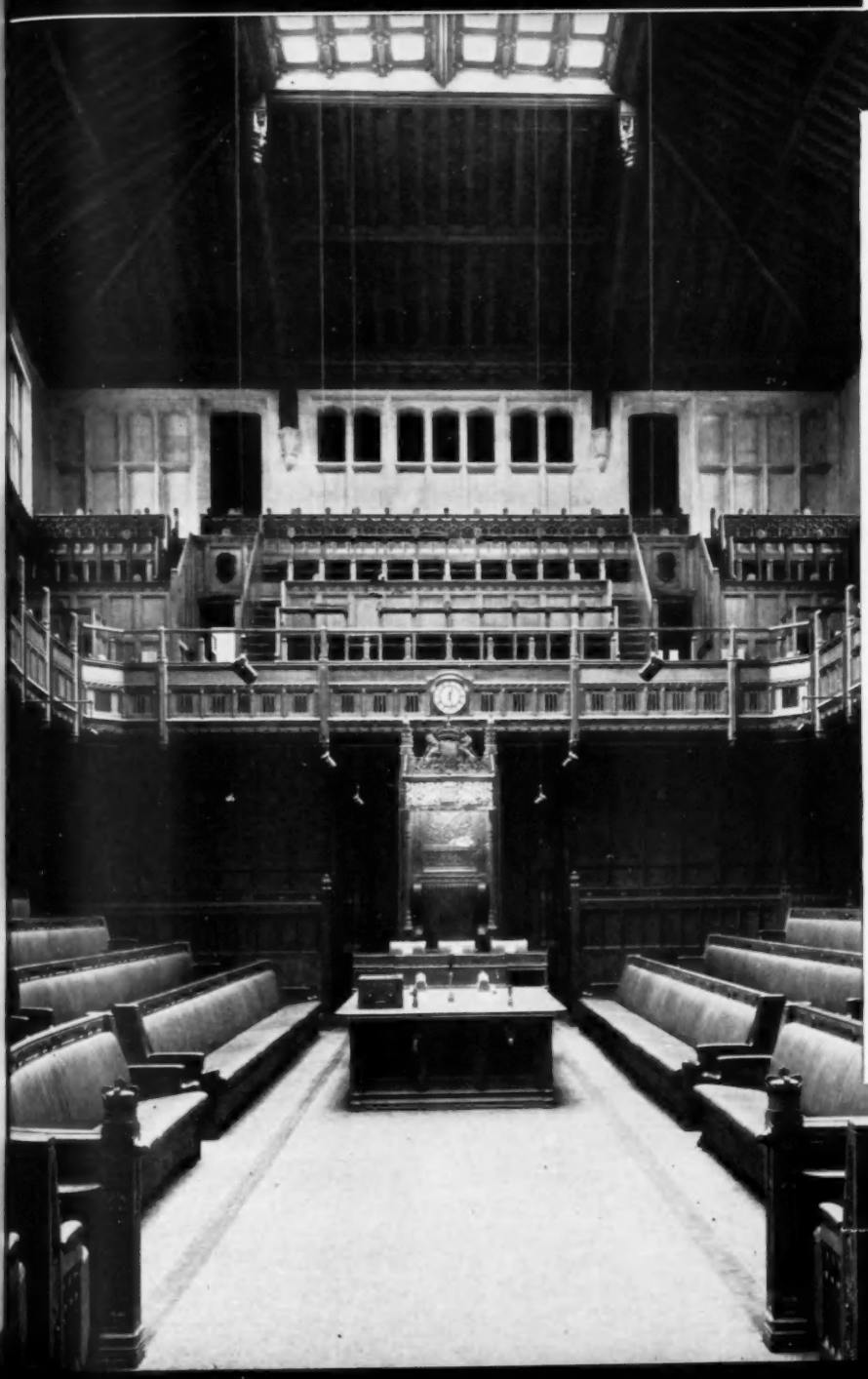


## Silicone insulated cables in the House of Commons

In 1950, 11,000 yards of B.I.C.C. Ltd's silicone rubber insulated cable was installed to supply lighting fittings in the House of Commons. The Superintendent of the Ministry of Works has reported: "Since the installation of the silicone rubber cable in 1950 it has given satisfactory service, particularly where bulkhead fitting and lighting trays are concerned. At these points the cable is subject to relatively high temperatures."

The advantages of silicone rubber insulated cables are that they:

- *Give continuous long term operation in ambient temperatures up to 200°C*
- *Will operate through and after fire*
- *Are resistant to steam, water and many chemicals*
- *Do not require any special terminating seals*
- *Have excellent resistance to electrical fatigue and corona discharge*
- *Are flexible at temperatures as low as –90°C*

**Midland Silicones Limited**

page 2

# *Silicones save space at Vauxhall Motors!*

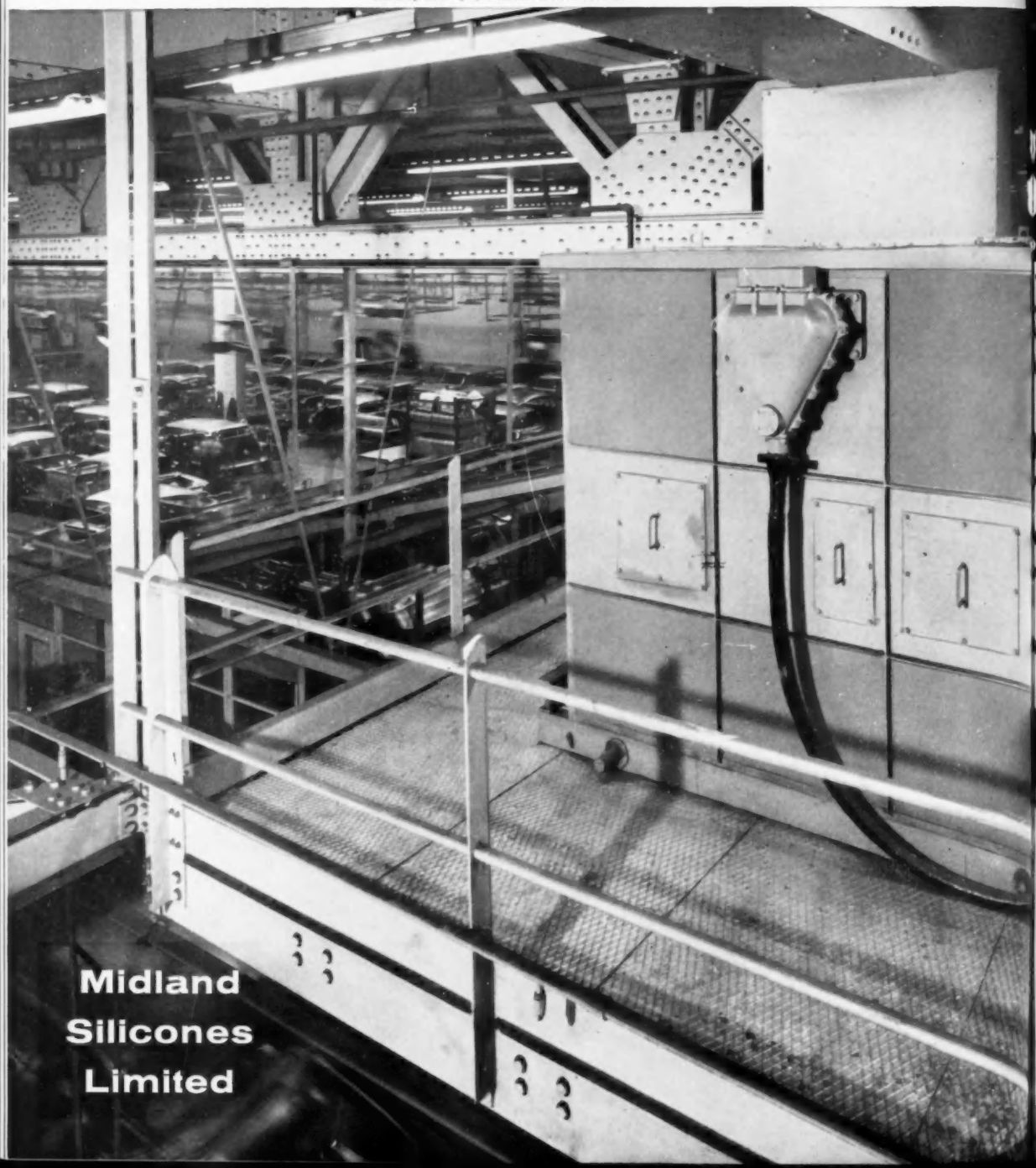
Fifteen 6.6kV/440V, 1000 kVA silicone-insulated dry-type transformers were chosen by Vauxhall Motors Co. Ltd. for the distribution system at the Luton factory. These electrical units were selected to eliminate the fire hazard and the construction and installation precautions associated with oil-cooled transformers.

Eight 6.6kV/760V, 1250 kVA dry-type silicone-insulated transformers are used to supply welding apparatus and, because these units have silicone insulation, it has been possible to mount them immediately below the roof—thus facilitating distribution and saving valuable floor space.

Advantages of silicone-insulated dry-type transformers include:

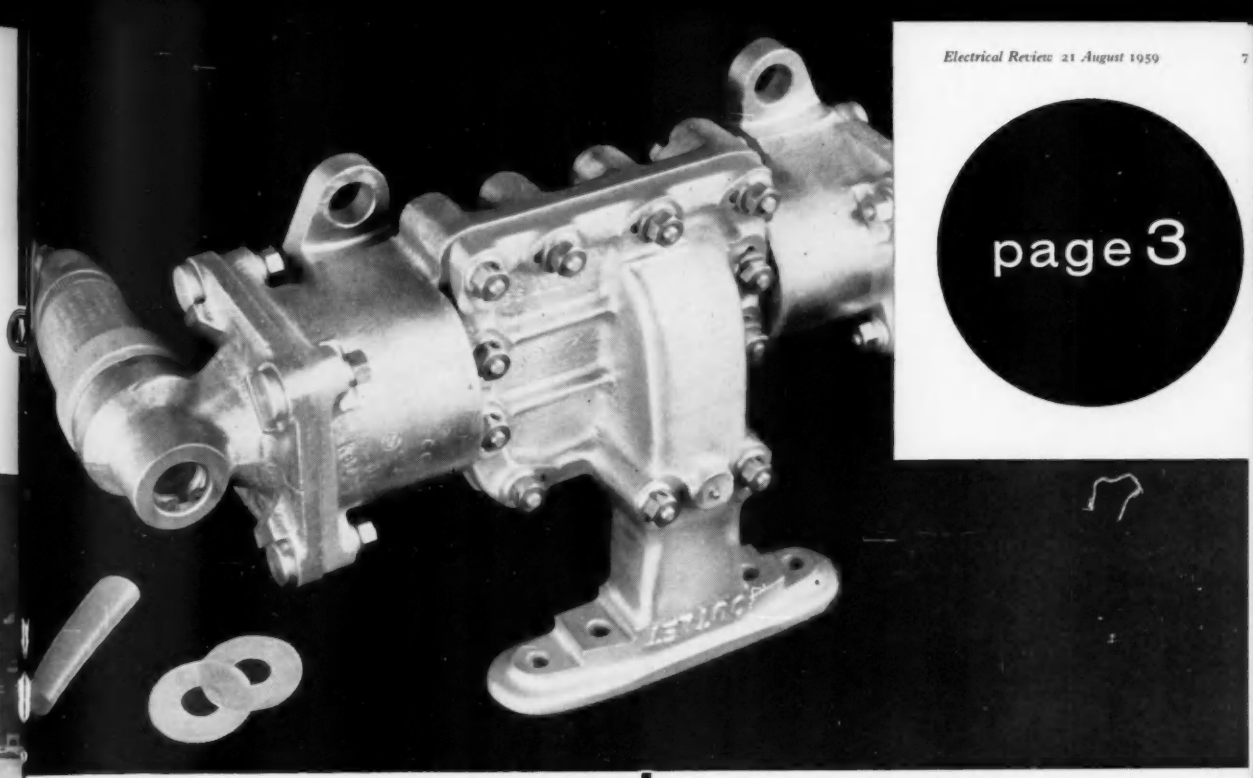
● *Can be placed at load centre, therefore making shorter low-voltage cable runs possible* ● *Smaller size and weight than O.N. or Class B Units* ● *No fire or explosion risk* ● *Frequent overloading permissible* ● *Dust, humidity and ventilation are no problems* ● *Reduced maintenance*

*Photo by courtesy of Vauxhall Motors Co. Ltd.*

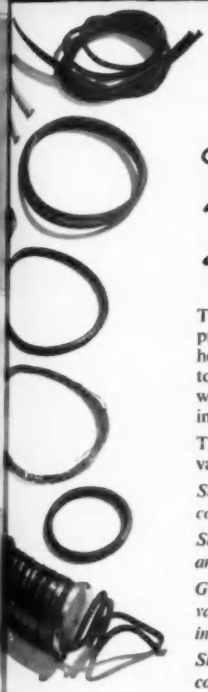


**Midland Silicones Limited**

page 3



*Pneumatically operated hot air valve*
*Photo by courtesy of Teddington Aircraft Controls Ltd.*



## Silicone equipped aircraft valve operates at 250°C

This valve is used on the Rolls-Royce Dart turbo-prop engine to control the flow of hot air to the heat exchanger used for fuel heating. It is designed to operate at temperatures as high as 250°C, which is why silicone products have been employed in its construction.

The many silicone materials used in this hot air valve include:

*Silicone rubber insert used in the high temperature connector plug.*

*Silicone varnished glasscloth used as insulation around the coil former tube.*

*Glass mica-glass material bonded with a silicone varnish, used as insulating material against the inside of the end cheeks of the coil former.*

*Silicone varnished glass covered wire used in the coil winding.*

*Woven glass sleeving used to protect the lead-out wires of the coil. This sleeving is subsequently impregnated with silicone varnish MS 997 during the manufacture of the solenoid at the final coil impregnation stage.*

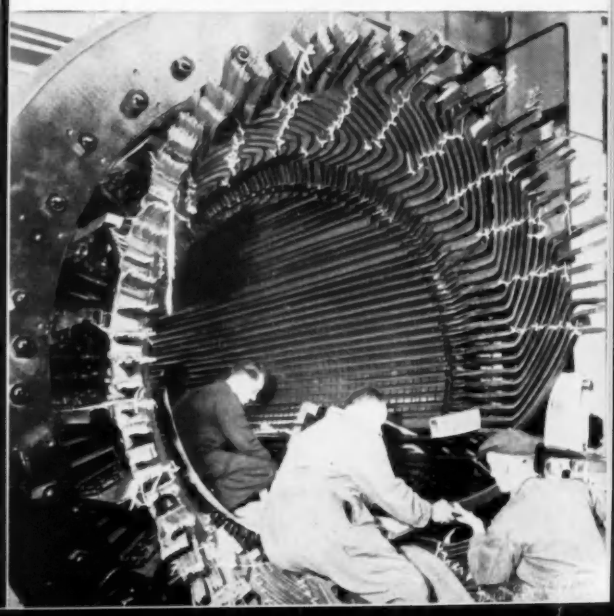
*A fully wound coil assembly impregnated with silicone varnish MS 997.*

Other silicone components used in the valve include 'O'-rings of silicone rubber for pressure seals, and silicone varnished glass sleeving to protect and support the junction of lead-out wires and conductor pins to connector plugs.

## 100 MW Hydrogen-cooled generators insulated with silicones

Silicone varnished, glass covered conductors are used for the stators windings of this 100 MW hydrogen-cooled generator built by C. A. Parsons & Co. Ltd. The photograph shows the winding of an inner stator core for the generator, which is one of the electrical units in a 200 MW cross-compound turbo-generator; the first of four which will be supplied to a Canadian contract.

*Photo by courtesy of C. A. Parsons & Co. Ltd.*



page 4

# Silicone insulating compound MS4 protects electrical equipment

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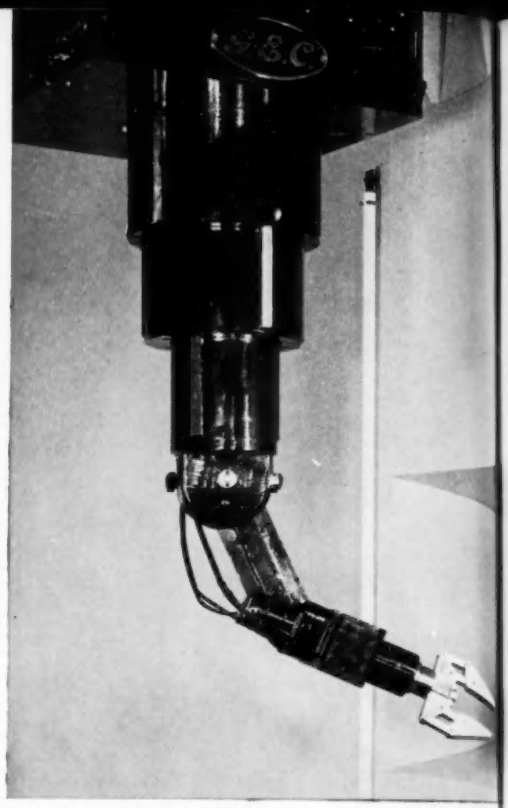

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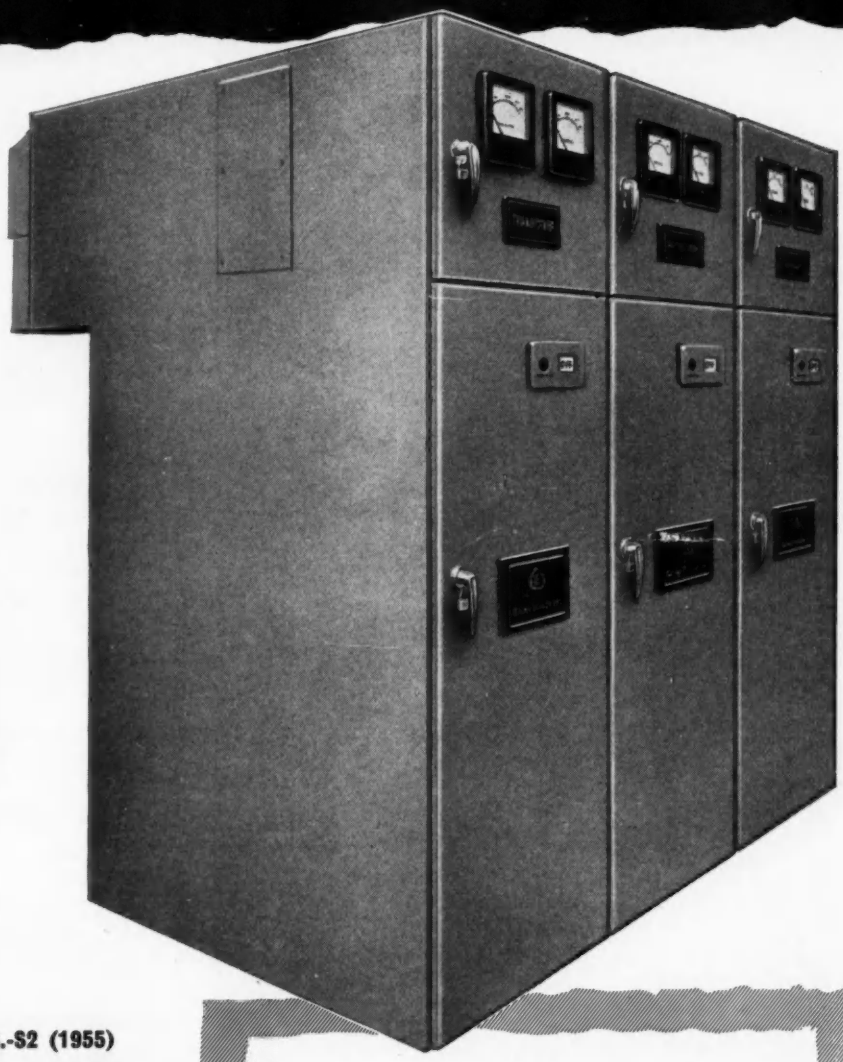

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FRIDAY
21 AUGUST
1959

# ELECTRICAL REVIEW

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## IN THIS ISSUE

**Reactor Policy** 55
The peaceful uses of atomic energy in Britain have been largely confined to the development and operation of the graphite-moderated gas-cooled reactor. The results of this policy are discussed in the light of the U.K.A.E.A.'s annual report

**Electricity Applied to Horticulture** 57
Present-day techniques employing electrical power in horticulture are reviewed and some indications given of the advantages that have been gained by its use

**Progress in Atomic Energy** 61
Summary of the annual report of the U.K.A.E.A. including a report of the Press conference at which it was disclosed that a new machine (I.C.S.E.) is to replace ZETA

**I.E.C. in Madrid** 63
Report from a special correspondent of the proceedings of the Technical Committees of the I.E.C.

**Mining Machinery Exhibition** 88
A large amount of specialised electrical equipment for the mining industry was displayed at the recent exhibition at Olympia sponsored by the Council of Underground Machinery Manufacturers

**Domestic Electrical Equipment—Electric Fires** 90
A survey of some hundreds of models, giving the names of the manufacturers and particulars of the loading, finish and price

✧ ✧ ✧ ✧

**Recent Lighting Developments** 66
**Views on the News** 67
**Progress at Hinkley Point** 69
**Personal and Social** 71
**Safety Interlocking** 75
**Industrial News** 79
**Generation and Development** 83
**New Electrical Equipment** 85
**Financial Section** 102
**New Patents** 105
**Contract Information** 106
*CLASSIFIED ADVERTISEMENTS* 127
*INDEX TO ADVERTISERS* 142

VOLUME 165 NUMBER 2 ✧ *Eighty-Seventh Year of Publication* ✧ FRIDAY PRICE 1s 6d

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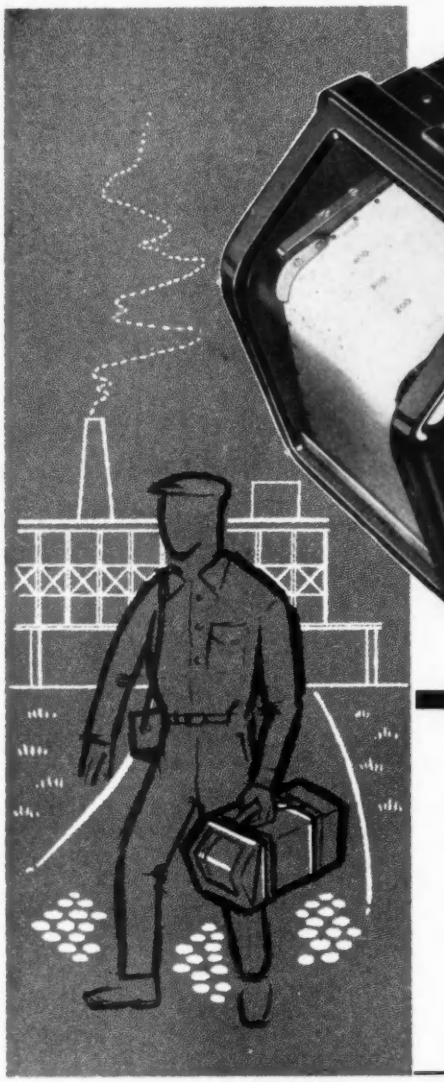

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ELECTRICAL REVIEW

21 August 1959 Vol. 165 No. 2 Established 1872

# Reactor Policy

THE only satisfactory fissionable material occurring naturally is uranium and this was the only fuel available when the prototype for Calder Hall was designed. At that time, enriched uranium was unobtainable for peaceful purposes so that the choice of reactor system was very limited. Since the building of the first graphite moderated gas-cooled reactor (BEPO) at Harwell in 1946, rapid advances in the development of this system have shown it to be the best for the production of base-load electricity in this country, although this was, perhaps, a matter of luck. The outlet coolant temperature has increased from 120 deg C in BEPO to 350 deg C at Calder Hall and it will rise to 375 deg C in the civil stations now under construction. Welding techniques have improved so that, instead of 2in thick pressure vessels as at Calder Hall, the first four civil stations will have 3in thick vessels, allowing higher gas pressures to be employed.

In contrast to Calder Hall, the boiling water reactor system is difficult to control and increased demand reduces the pressure, which raises the density and this, in turn, reduces the activity. In the pressurised water reactor, the water which is used as a moderator has to be contained under pressure to prevent its boiling. This produces a number of involved mechanical problems. These facts and the present demand for base-load electricity have led this country to concentrate on the Calder Hall type of reactor and its development in the form of the advanced gas-cooled reactor, a prototype of which is being built at Windscale. It is expected that the eighth civil station to be ordered will be of this advanced type and will have an outlet coolant temperature of 500 deg C.

Recently, in our opinion, there has been undue pessimism regarding the United Kingdom nuclear power programme. Estimates of power demand by 1965 indicated that coal requirements would amount to about 60 million tons, rising to over 100 million tons in the 1970s. By 1966, the nuclear power programme would save 15 million tons, but it must be remembered that the production of electricity from coal is still cheaper than that from nuclear power. With the present systems, electricity costs from conventional and nuclear power stations should reach parity before 1970.

In the export field, it has, perhaps, been a disadvantage for Britain to have concentrated on the Calder Hall design, since because of its high capital cost it is essentially a base-load system. The annual report of the United Kingdom Atomic Energy Authority, which is summarised in this

issue, indicates that part of the Authority's development programme will contribute to the development of reactors suitable for the export market. At a Press conference following the publication of the report, Sir William Penney stated that a new experimental thermo-nuclear machine I.C.S.E. (intermediate current stability experiment) had been designed. It would appear that, even in its modified form, ZETA was too far advanced in conception to provide enough information regarding the basic principles of fusion and I.C.S.E. had been designed to bridge that gap. At Aldermaston Court, however, Sceptre IV has been completed and is now undergoing commissioning tests. This machine is similar to ZETA but, in contrast to Harwell, the A.E.I. research team hope to discover what went wrong with ZETA from direct study with Sceptre.

## GETTING TOGETHER

Recent pronouncements by the chairmen of the nuclear power groups have made it clear that the prospects of overseas orders for full-scale stations are not so rosy as was thought at the outset. This means that the enormous research and development costs will not be spread over so many contracts and their recoupment will be very difficult.

Inevitably, perhaps, in this entirely new field each consortium had to find its own way. Now that the general pattern has been settled much of the work involved in tendering for stations is being duplicated by highly-qualified men whose services are urgently needed elsewhere.

In these circumstances it was a wise decision of two of the groups—A.E.I.-John Thompson and the Nuclear Power Plant Co.—to agree to collaborate, particularly in connection with the projected Dungeness and Sizewell nuclear power stations. The full implications of this co-operation are not yet known. An important feature could be the pooling of operational experience when the stations already under construction get going. It is probable that the other consortia will take note of this example and endeavour to rationalise their activities.

## POWER AND ELECTRONICS

The Joint Committee for the Award of National Certificates and Diplomas in electrical engineering has notified technical colleges throughout the country that ordinary certificate courses should contain more electronics. This, they say, should be introduced, even at the expense of machine theory. In a letter to the colleges, they state that some college syllabuses reflect the predominance that power engineering enjoyed at the time the syllabuses were compiled, particularly with regard to d.c. machines. This is a commendable reassessment but we feel that the root of the problem has still not been tackled.

During the first years of any course in electrical engineering, the basic principles should be taught in a realistic manner. Most fundamental courses in magnetism and electricity are quite outdated. If an entirely new approach to the subject were made (as was suggested in an article on page 672 of the *Electrical Review* of 10th April, 1959), electronics would fall into place quite naturally. There would be less need to specify that various percentages of the course should be devoted to this or that subject. Moreover, lecturers would be freed from a too-slavish adherence to the syllabus.

## EARTH WIRE COLOURS

In warning its members about the colour coding of three-core flexible wires attached to imported appliances the Electrical Contractors' Association has drawn attention to a real source of danger. The Association mentions the increase in the importation of domestic appliances and industrial machines and says it is frequently not realised that although the colours of the cores may be the same as in British flexes they may have other significance. Several countries use the red core for earthing purposes while in Great Britain red is the line wire: the possibility of serious danger here is obvious. Other countries use other colours.

While electrical contractors and their employers are thus made aware of potential trouble it is quite certain that most users who attach their own plugs to the flex on foreign equipment will know nothing about it. It is therefore incumbent upon all sellers of imported appliances to acquaint themselves of any difference between British and foreign practice and to see that their customers are warned. There may be a need for regulations, or at least " official " advice, on the subject.

## MINING EQUIPMENT EXPORTS

The emphasis placed on safety in equipment manufactured in this country for operation underground and particularly in coal mines was evident in the exhibits, a large number of which were electrical, shown at the Mining Machinery Exhibition held at Olympia and sponsored by the Council of Underground Machinery Manufacturers. The safeguards demanded by authorities in this country are exacting, requiring considerable design ingenuity, but necessary in view of the conditions in which the equipment may be required to operate, and lives may be lost if the gear does not comply with the regulations.

These safeguards are automatically incorporated in new designs produced by British manufacturers, and one feature arising from this is the benefit felt overseas from the stringency of regulations in the United Kingdom. Certainly from this aspect overseas buyers can have every confidence in our products, and this is important at the present time when mining machinery manufacturers are able to concentrate on the export market due to the declining needs of the National Coal Board, whose modernisation programme has in the past been so demanding.

The exhibition itself should have materially encouraged export business, for a large number of overseas visitors from more than 50 countries attended, many of whom also participated in the symposium on shaft sinking and tunnelling held concurrently. The fact that the 25 papers read were prepared by authors from no fewer than 14 countries indicates the extent to which the mining industry is international. A great deal of co-operation between countries is enjoyed by research and other mining organisations, and there seems no reason in such circumstances why a good product should not find a ready overseas market.

# Electricity Applied to Horticulture

By C. A. CAMERON BROWN, B.Sc., M.I.E.E., M.I.B.Ag.E., and A. W. GRAY, Associate I.E.E.*

**The use of electricity in horticulture has expanded considerably during the past twenty years, with the increasing electrification of rural areas, the development of suitable appliances and the availability of electricity as a comparatively cheaper form of power. In this review the authors summarise the methods adopted in the various fields in which electricity is now used and the advantages accruing from its use**

DURING the past twenty years or so, and more particularly since the nationalisation of the supply industry, rural electrification has achieved a prominence and publicity which would have amazed some of the early pioneers and has even surprised and gratified those of us who have grown up with this revolutionary change. Whether or not rural electrification embraces horticultural electrification is a moot point, since much of the more intensive horticulture is carried out in urban fringe areas rather than in the rural areas proper. Nevertheless, it must not be overlooked that while the technique of farm electrification has been revolutionised, both in range and degree of application, an even greater revolution has taken place in the electrification of horticulture, both professional and amateur. It is not merely that a great many more growers are using electricity but that the range of practicable and profitable applications of electricity to horticulture has expanded to an astonishing degree.

Twenty years ago it would have been bold to suggest that a commercial grower should use electricity for space heating and rash to encourage an amateur to heat his greenhouse electrically unless he was favourably situated in one of those urban areas with tariffs so low as now to seem fantastic. Indeed, it is doubtful whether the proper method of assessing glasshouse heating requirements was then known at all, much less generally available. Soil warming was used then but hardly as more than an experiment. Today both applications are among the many in wide use and it would be no exaggeration at all to say that neither amateur nor commercial growers can handle glasshouses effectively or economically without the use of electricity in some way or other. This review is aimed at outlining briefly the present position in the electrification of horticulture.

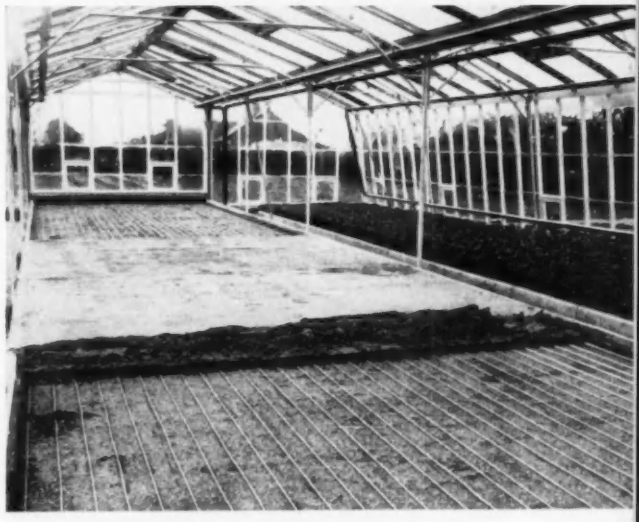
## Space Heating

Electricity can effectively be applied to the heating of a commercial glasshouse, either directly or through the electrical operation of the auxiliary control gear involved in modern methods of heating by hot water circulation, the type used depending on the scale of working. The amateur, and the smaller commercial grower with his propagating house having an output of high specific value, are probably better served by using electricity for the direct provision of heat through an electrical heating device of some kind, e.g. tubular heaters, fan heaters, or by immersion heater and hot water circulation.

These developments have been made practicable by a combination of circumstances. Electricity at present rates is probably equivalent to a pre-war rate of one-third of a penny per kWh while coal and oil have increased in price, and the scarcity and cost of labour puts a considerable premium on automatic control. Not only is automatic control of direct electrical heating obviously practicable and attractive but through electrical auxiliaries automatic control can be applied to any commercial glasshouse installation from a smallholding with one or two tomato houses to the most extensive and expansive commercial glasshouse holdings in the country. In the former case the coal-fired boiler is "fed" by hand but the burning is controlled by a forced draught fan unit operated by a thermostat in the glasshouse, and at the other end of the scale there is the large oil-fired installation using heavy oil, in which electricity can perform as many as fourteen different functions from heating the oil by immersion heater to controlling the hot water circulating pump.

However, the direct use of electricity for heating has become a widely applicable proposition as a result of two developments. One is the evolution of reliable methods for determining the proper heating load and for assessing

* Commercial and Development Department, Electricity Council.

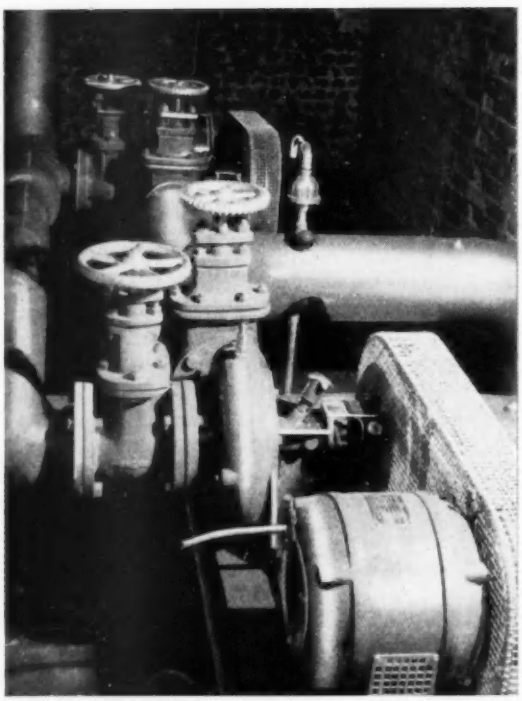


*Mains voltage cables for warming a propagating bed*

with fair accuracy over a period of years the probable consumption, using Grierson's "degree-day" system. The other is the establishment of the part played by space heating in maintaining soil and root temperatures. With the development of electrical soil warming and soil warming equipment to meet any soil or root requirement, and with the precise control provided by the thermostat, it has been found practicable in many cases to reduce the space temperature in propagating houses substantially below that at one time thought necessary, enabling electrical heating to be used at a reasonable cost even to the smaller commercial grower. For the amateur there can hardly be any practical alternative to space heating by electricity, combined with soil and bench warming by electric cables. The work now being carried out towards the development of off-peak methods of glasshouse heating may well lead to a complete revolution in the use of electricity in horticultural heating.

## Soil Warming

The revival of soil warming came with the development of simplified methods of raising salad crops in hotbeds during the war, and from that basic method has grown



*Circulating pumps for a commercial scale water heating installation*

a wide use of electric wires and cables for warming soil for growing and sand beds for propagation. Low-voltage equipment—seldom exceeding 30 V—consisting of a grid of galvanised iron wire energised from a transformer is used in borders and beds where cultivation is likely to take place, while mains voltage warming cables are more usually used for warming the sand beds which provide the root temperature required for propagation on benches and in frames.

The original high hopes of a large-scale use of low-voltage wires in commercial tomato houses have not been fulfilled, and the possibility of lowering space heating costs by running the houses at lower temperatures while the root temperatures are maintained electrically has not yet been fully exploited, but rising space heating costs may bring a change of policy in due course and open the way to this excellent off-peak load. Equally, the "fool-proof" technique of soil warming salad beds in frames, which was developed during the war by the E.R.A. and really reopened the soil warming field, has not spread substantially in the commercial world because, unlike the Dutch and the French, our growers are not, on the whole, "frame minded." Some, however, make most effective use of this most simple aid to "French gardening" and, of course, many amateurs have confirmed and enjoyed the simplicity, economy and efficiency of the method.

Nevertheless, this pioneer soil warming work has not been wasted because it has turned attention to the use of electric cables and wires for providing the base heat for propagation either from seeds or from cuttings, where root temperature requirements are comparatively high—55 to 75 deg F—and the provision of such local heat from general space warming is a most expensive procedure. There are now many commercial propagating houses where the benches are locally warmed: probably the most notable is an installation in the Midlands Board area which has 300 kW of such bench warming, all off-peak.

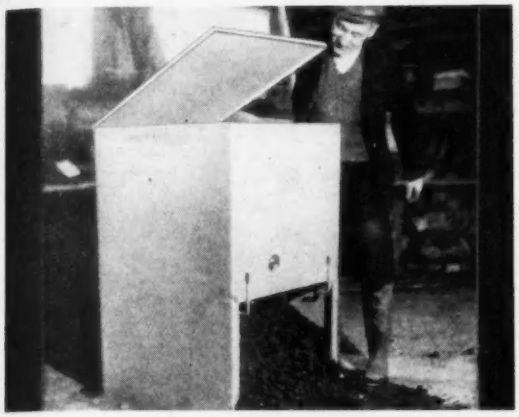
Not only has bench warming by electricity become an accepted horticultural technique but, by reducing the need for high space temperatures in the propagating house, it has often made it practicable and economical to use electricity for the space heating, a condition quite frequently found in the smaller specialist nursery where there is a premium on skilled labour and unwillingness to waste it on boiler attendance.

The use of soil warming equipment has been ambitiously applied to the provision of "micro-climates." A nurseryman handling high-class and specialised production may require a range of temperature conditions to meet the needs of different plants at different stages. In the larger scale of production he would provide a special house and heating for each requirement, but the smaller man—not by any means less skilled—has been faced with a serious problem because he may only be able to afford one house.

The problem is solved by the provision of "micro-climates" in small frames or glass cases normally inside the main house and generally on the bench, though the technique can be applied to outdoor frames if a movable cover is provided to give weather protection when the frame is opened. Each frame is provided with its own base heating and space warming equipments complete with thermostat to maintain the required "climate." Because of its unobtrusiveness mains voltage warming cable is generally used for the space heating as well as the base heating.

## Light

While growers were using artificial means of providing heat—even for soil warming—long before the advent of electricity, it was not until it became available that they could consider the artificial application of light, another basic plant requirement. Increasing practical use has been made of electric lighting to assist growth, but it is only comparatively recently that substantial practical commercial help has been available through electric lighting since the development of specialised lamps. The authors refer only to light used on the plant, since it is hardly necessary to mention the revolution in working



*An immersion type soil steriliser*

conditions brought about by electric lighting, particularly in packing sheds and potting sheds where a high pressure of seasonal work during the shorter days had always been a difficulty until adequate electric lighting became available.

Artificial lighting in plant growth takes three broad forms, supplementary lighting, extended lighting, and replacement lighting. Supplementary lighting is an application, developed by the John Innes Institution, of light from mercury vapour lamps to young tomato and cucumber seedlings in addition to natural daylight during the winter and early spring months when natural daylight is of low value. The supplementing of daylight by this type of lighting produces plants not only ready for planting some two weeks earlier but of better quality. Not only does cropping start earlier because of this accelerated planting but the treatment ensures the development of the valuable lower trusses, thus contributing as much as anything to the catching of the earliest, and most rewarding, market. There are some particularly good installations of mercury vapour irradiating lamps in the North West and in the West Midlands, and their use is gradually spreading to other tomato-growing districts.

Extended lighting is applied to plants which respond to the length of day, the response being either an acceleration of cropping date or a retardation. The main application of extended lighting has been to chrysanthemums which respond by delaying the date of flowering; by variously shading some plants from daylight and treating others by electric light an almost continuous cropping can be obtained. The largest installation of this kind in this country is on the south coast and comprises 220 kW of tungsten lamps, all being off-peak and using some 100,000 to 125,000 kWh per annum.

Replacement lighting is the use of lamps, generally either tungsten or fluorescent, to replace natural daylight, enabling plants to be flowered in such dark structures as sheds and cellars. This opens the way to forcing plants inside insulated, or "low heat loss" buildings where the cost of the light is more than counterbalanced by the reduction in heating costs. So far, however, the technique has only been applied commercially to the flowering of bulbs and though still limited in scale the results have been highly satisfactory.

A related application, made not so much to force growth as to control it, is the use of fluorescent lighting to control the sprouting of seed potatoes in chitting houses, windowless and comparatively safe from frost, while frost protection is provided by a fan heater of modest loading.

## Soil Sterilisation

The use of electrically produced heat for sterilising or pasteurising potting soil, killing pests and diseases, had been practised for many years on the electrode principle, in which the soil is heated by the passage of an electric current. The development by the E.R.A. of the immersion principle, whereby the soil is heated by conduction from hot plates immersed in the soil, opened the way to a wider use of the electrical method, particularly in the smaller scale of working. Many sterilisers of both types are in use but there is some reluctance on the part of commercial growers to accept the possibility—already established in many nurseries—that such basically small appliances of some 4 cwt capacity can deal with the large quantities of soil which are involved. Some growers do now appreciate that by intelligent planning the easily operated electrical steriliser can handle large quantities of soil with less trouble than before and for an expenditure of some 50 kWh per ton. This may be an appropriate point to venture an opinion that commercial horticulture needs very badly an "Appliance and Method" advisory service.

## Hot Water Treatment

It is important that plants grown in a compost which has been sterilised shall be clean and free from pests and diseases, and an important safeguard against the carry-over of these in seeds, bulbs, stools and runners, is their immersion in hot water baths, a close temperature control being necessary. For such treatment, extending up to three hours or so, the heating and control are best done electrically, and this practice is widely adopted.

*Low voltage soil warming wires for hot-bed work in frames*

Immersion heaters, thermostatically controlled, fitted in the base of the bath heat the water and an electric pump circulating the water at a relatively high speed ensures an even temperature throughout the bath. In the treatment of bulbs electrically operated hoists overcome the problem of handling the quite considerable bulk and weight. Electrical heating is also widely used for the provision of hot water for general purposes about the nursery.

One of the outstanding needs is a completely automatic ventilation system for glasshouses and this is a problem which up to now has only been tackled; it still remains to be solved. While the use of extractor fans, thermostatically controlled, pulling air into the greenhouse through the overlaps of the glass and from around the door, has provided this for the amateur size greenhouse, it has not yet supplied the answer for large-scale glasshouses. The need has been met in part by the power operated opening of ventilators controlled by a thermostat, but manual selection of the set of ventilators to be operated is still necessary. It is hoped that developments now in hand will solve even this problem electrically. The circulation of air within the glasshouse, a very necessary condition particularly with tall and dense crops, can, however, be provided most effectively by blowing air, either warm or cold, from an electrically operated fan through perforated polythene tubing laid through the crop at ground level.

*The warming cables and the water spraying equipment for mist propagation*

## Mist Propagation

The latest electrical application, and one which has been readily accepted by growers and nurserymen, is that of rooting cuttings under a regulated mist of water and in full light. The control of the misting periods is entirely automatic and electrical, and when not available from the water main the required water pressure for the misting nozzles is provided by a motor driven centrifugal pump or pressure set. The electrical significance of mist propagation rests, however, in the fact that an essential requirement for successful " mist propagation " is a root temperature of 75 deg $F_s$ and this can be provided only by thermostatically controlled electrical warming wires or cables laid in the propagating bed. With some subjects difficulty was experienced in weaning the rooted cuttings from the humid conditions under mist to normal growing and watering conditions. This too has been solved by means of an electrically operated controller which gradually reduces the frequency of the mist falling on the rooted cutting until finally it is weaned from the mist conditions and normal watering can be started without check to the plant.

## Power

There are many and diverse electrical power requirements in horticulture. As in other industries the electric motor is widely used, providing power for heating equipment and for ventilation, for pumping and circulating water, operating washing and grading machines and at the more advanced nurseries driving conveyor belts and electric trucks for the movement of materials and crops. In refrigeration for the treatment of bulbs, the cold storage of produce and in the new technique of " hydro-cooling "—the cooling of crops by chilled water prior to dispatch to market—the electric motor plays an essential part. Nor can any nursery, or market holding, which possesses a workshop operate this satisfactorily without a full range of modern power driven tools. The use of electrically operated tillage implements has posed some very difficult problems and it would be unrealistic to suggest that these have been solved. Nevertheless, for the smaller holding at least, there are certain electrically operated tillage tools which are perfectly practical. A really satisfactory solution of the problem of handling the supplying cable would undoubtedly lead to a considerable use of such machines.

The progress over the last twenty years has indeed been gratifying but much still remains to be done. The indications are that while the more obvious problems have been solved by electrical means there is a tremendous scope for developing electrical aids to horticulture. While electricity is likely to have more and more to offer to horticulture, equally has horticulture great possibilities to offer in the form of substantial revenues to the Electricity Boards. Properly developed, the horticultural holding can provide revenue far in excess of its opposite number in farming and generally—and this is important—for a much smaller expenditure on supply mains. There are already many horticultural holdings each using over 100,000 kWh per annum and without yet making full use of all the advanced processes which are now available to them.

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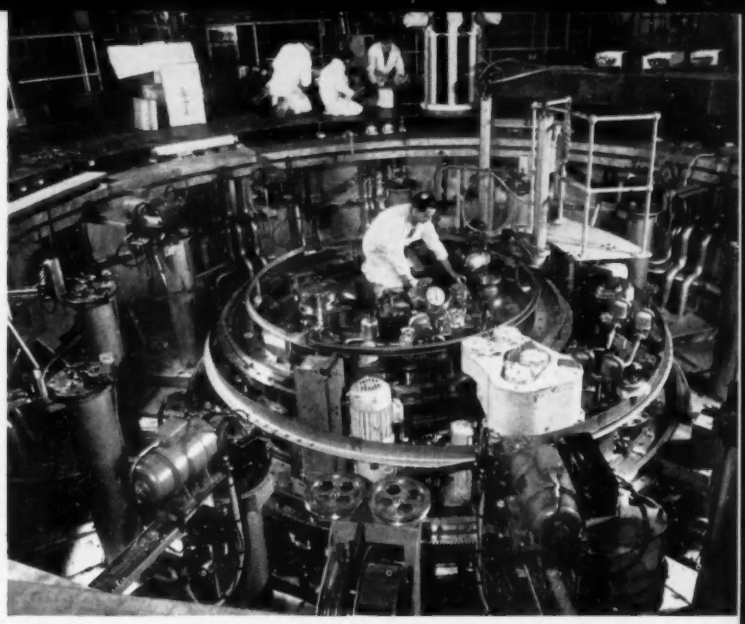
### HARWELL REACTOR SCHOOL

STANDARD Course No. 19 will take place at the Harwell Reactor School on 31st August and continue until 18th December. Half of the places at each course are allocated to overseas students and a fee of £250 exclusive of accommodation is charged. A special course for senior technical executives will be held from 21st September to 1st October. This is the ninth of its kind and the fee is 50 guineas exclusive of accommodation. Application forms and details of both courses can be obtained from the Principal, Reactor School, Atomic Energy Research Establishment, Harwell, Didcot, Berks.

# PROGRESS IN ATOMIC ENERGY

## ANNUAL REPORT OF THE U.K.A.E.A.



*The top of the stainless steel pressure vessel in position in the reactor vault at the Dounreay fast reactor*

MAJOR events during the year ended 31st March last, described in the fifth annual report of the United Kingdom Atomic Energy Authority,* include the commissioning of the first reactor at Chapelcross and the commencement of constructional work at Winfrith Heath and at Windscale where the advanced gas-cooled reactor prototype is being built. The last of the four Calder Hall reactors became critical on 8th December, 1958.

The Authority's effort in the fast reactor field was increased during the year and the construction of Dounreay was completed. Charging of the liquid metal circuits with sodium potassium alloy was almost completed by the end of the period under review and the breeder blanket fuel elements had been loaded. It is hoped that the reactor will begin low power testing during this month, will reach an output of 1 MW within two or three months and an output of 12 to 15 MW by April next year. At Harwell, the zero energy fast reactor, ZEPHYR, which was fuelled with plutonium, was dismantled in June, 1958, after the completion of some measurements on fast systems with coupled moderating reflectors.

Preliminary work on the prototype advanced gas-cooled reactor (A.G.R.) began at Windscale in October, 1958. The basic reactor physics problems are being studied by the research group at Harwell but, for the full development of the A.G.R. for power generation, more extensive experimental facilities are necessary and a zero energy high-temperature reactor, HERO, is being built at Windscale. In this a variety of core assemblies can be built up for the study of different designs. Initially, beryllium-canned uranium oxide fuel will be studied, but later these studies will include plutonium-bearing oxide fuels for more advanced applications of the A.G.R. system. The reactor will be supplied with hot carbon dioxide so that it can be operated at temperatures up to 500 deg C.

Steady progress has been made with the research and development programme for the high-temperature gas-cooled reactor (H.T.G.C.). The immediate emphasis of the work is on the development of a reactor based on graphite as the moderator and container for the fissile material. Considerable advances have been made in the production of new types of graphite both in the experimental plant at Harwell and by outside contract where methods of rendering the graphite impervious to gas and fission products have shown considerable promise. An extensive programme was put in hand to determine the resistance of these new graphites to radiation. A series of exponential experiments to measure certain basic physics constants of the system was in progress at Winfrith Heath and construction of the high-temperature zero energy experiment, ZENITH, at Winfrith Heath was almost complete.

During the year the Authority began to study the design of an experimental plant, which could be modified for electricity generation, in which a 100 MW (thermal) experimental steam-cooled heavy water (S.C.H.W.) reactor could be operating by the end of 1962. This plant would contain common services for a second reactor to which, if required, a boiling light water reactor (B.W.R.) could be added in due course.

The new high flux reactor, PLUTO, at Harwell, came into operation during the year and has been brought up in stages to a power of 10 MW (thermal). The other high flux reactor, DIDO, continued to run at 10 MW (thermal). The materials testing reactor at Dounreay (D.M.T.R.) was commissioned and became critical in May, 1958. With the reduction of work on the homogeneous aqueous reactor, the programme intended for the zero energy reactor, HAZEL, at Harwell, was curtailed. This equipment was dismantled in September, 1958, and is being transferred to Dounreay for general studies of criticality problems in chemical plants. At Aldermaston, the light water-moderated research reactor, HERALD, which will be used for neutron physics and radio-chemical studies, was in an advanced state of construction at the end of the period under review. Throughout the year the zero energy light water reactor HORACE was the main preoccupation of the reactor team at Aldermaston. This work has proved of value in the basic study of HERALD characteristics. At Harwell a light-water-moderated system called EUREKA for approach-to-critical experiments is nearly complete. This will be a flexible assembly in which the ratios of moderator to fuel, and canning material to fissile material, can be altered over a wide range. In addition, it will be possible to raise the water temperature to 80 deg C so as to measure temperature coefficients.

### Thermonuclear Reactors

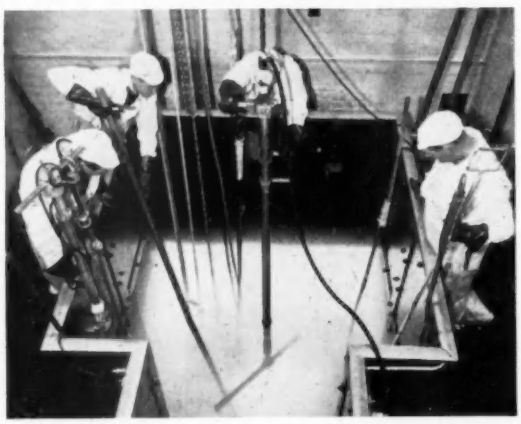
At the high temperatures required to give nuclei sufficient energy to fuse together and so release energy, all matter is gaseous and the name plasma has been given

* H.M. Stationery Office, price 5s.

to matter in this form. A great deal more must be known about the properties of plasma before a successful fusion reactor can be built. The results of experiments on the improved ZETA have shown that, although the plasma is pinched by its own magnetic field, an excessive amount of energy is being lost to the walls of the tube. The exact mechanism by which this energy is being lost is not fully understood but there is some evidence that energetic electrons are continually being lost to the torus walls and are being replaced by less energetic electrons. The electron energy has been found to be considerably less than the energy of the impurity ions in the discharge. It had been expected that the electrons, being lighter, would acquire more energy than the ions and that the ions would acquire energy as the result of collisions with electrons but evidently the reverse is true. A further discovery is that current flows throughout the volume of the current channel and there is no tendency for it to flow in a thin skin on the surface of the channel. Theoretical studies suggest that only if such skin currents are formed will the current channel be stable and not wriggle about in the tube and touch the walls from time to time. Instabilities of this kind lead to serious losses of energy from the discharge.

At a Press conference, Sir William Penney said that a machine capable of tackling more basic problems than could be determined from ZETA has been designed at Harwell. The new machine, I.C.S.E. (intermediate current stability experiment) should be running in about two to three years' time and will be built at a new establishment to which all controlled thermonuclear reaction research work will be transferred. The machine, which will produce no power, will be larger than ZETA, but will also be of the torus type with a fast pinch instead of the slow pinch associated with ZETA. The condenser bank will be capable of delivering between 5 and 10 megajoules. With this machine, it is hoped to obtain a stable plasma by a very elaborate arrangement of magnetic fields and so determine the basic principles of fusion which were unobtainable by means of ZETA. In consequence, work on ZETA II has been slowed down.

At Aldermaston, exploratory studies have been made of a proposed experimental device called HITEX (high-temperature experiment). The hot plasma is built up by injecting high-energy molecular ions into the vessel and arranging by some means, such as dissociating the injected molecular ions, that the plasma is contained in an externally-generated magnetic field, produced by coils driven from ordinary power sources. As the ions tending to leave the plasma will be reflected by the magnetic field back into it, the device is, in effect, a mirror machine of a particular type.



*A Calder Hall fuel element being carried under protecting water to the de-canning machine at Windscale, before being taken to the primary separation plant where the plutonium and fission products are separated from the uranium*

## Other Research

Research involving particle accelerators is being carried out at Harwell and four new machines are either in course of commissioning or construction. The largest of these, the 7 GeV proton synchrotron, is being built for the Rutherford Laboratory of the National Institute on a site adjoining the A.E.R.E. The monolithic concrete foundations for the 7,000 ton 150ft diameter magnet, the arched concrete roof and the shield bridge 28ft thick have been completed. The second machine being built at Harwell for the National Institute is the 50 MeV proton linear accelerator. The other two machines are being commissioned for use by the A.E.R.E., the first being a 25 MeV electron linear accelerator and the second a vertical 12 MeV tandem electrostatic generator, similar to the one recently commissioned at Aldermaston.

## Two Future I.E.E. Conferences

THE Electronics and Communications Section of the Institution of Electrical Engineers announces that it is organising the Third International Conference on Medical Electronics in London in the second half of July, 1960, in association with the International Federation for Medical Electronics which was inaugurated this year. There will be general sessions to enable medical practitioners and electrical engineers who are not experts in medical electronics to increase their background knowledge of the field, and specialist sessions in which those engaged in medical electronic work can present papers on the latest developments and discuss particular problems in greater technical detail. Present plans include the organisation of an International Scientific Exhibition on Medical Electronics in conjunction with the conference.

The Measurement and Control Section and the Supply Section of the I.E.E. announce that they are organising jointly a convention on the Impact of Nuclear Development on Electricity Supply and on Instrument Techniques, to be held in London in September, 1961. Among the subjects to be discussed will be present and future energy requirements in relation to resources; economics; operating characteristics; the siting of nuclear stations and its effect on system planning; and health physics. The organising committee will be pleased to receive offers of papers for consideration for inclusion in the convention. The Council understands that the Federation of British Industries is considering holding a conference on the general problems of nuclear generation during 1961, and there will be an appropriate co-ordination of arrangements where possible.

## Electric Lifts

THE recently issued second part of B.S. 2655 applies specifically to single-speed polyphase slip-ring and squirrel-cage induction motors for lifts which require a driving power of not less than 1 h.p. One of the four appendices contains a 14-point summary of the type of information which an intending buyer should supply with his inquiry or order, the other three dealing with temperature measurements, quietness of operation, and metric conversions. Although it will still be necessary to use B.S. 2613, "Electrical Performance of Rotating Electrical Machinery," as a basis for ordering lift motors, the new specification contains many additional requirements necessary for successful lift operation. Copies may be obtained from the Sales Branch of the British Standards Institution, 2, Park Street, London, W.1, price 4s.

**Continuing the report of the proceedings at the 1959 Grouped Meeting of the International Electrotechnical Commission in Madrid (see last week's issue, page 35), in the following pages an account is given of the work of the Technical Committees. The Charles le Maistre Memorial Lecture, prepared by Mr. A. M. Nekrasov (U.S.S.R.), is also reviewed**

# I.E.C. IN MADRID

**FROM OUR SPECIAL CORRESPONDENT**

IT is impossible to report in detail on the work of the numerous technical committees and sub-committees which met in Madrid during the 1959 Grouped Meeting of the International Electrotechnical Commission (29th June to 10th July), but the following brief notes give an indication of the wide field covered.

To appreciate the progress made it is necessary to understand certain features of I.E.C. procedure. When a document has been fully discussed by a technical committee it is circulated to the National Committees for approval under the so-called six months' rule. This means that within a period of six months the National Committees have to vote for or against the document for issue as an I.E.C. Recommendation. If the necessary four-fifths majority in favour is obtained the document may then be published, or amendments may be proposed by the chairman with a view to meeting some of the comments submitted by the National Committees. These proposed amendments are circulated to the National Committees for approval under what is termed the two months' procedure.

*Electric Welding.* (Secretariat: United Kingdom).—An Experts Committee, set up on the authority of the Committee of Action at its meeting in Moscow in July, 1957, for the purpose of maintaining liaison with the I.S.O. committee on welding, and to ensure that the safety aspects of electric welding equipment are adequately dealt with, is working in collaboration with the Hygiene and Safety Commission of the International Institute of Welding. The Experts Committee sought (and obtained) the approval of the Committee of Action to a procedure under which the recommendations on safety requirements for electric welding equipment will be drawn up in the form of a report for submission to the I.S.O. (after approval under the six months' rule), with a view to the recommendations being included in the appropriate I.S.O. Recommendations.

*Power Transformers.* (Secretariat: United Kingdom). —The Committee met in Paris under the chairmanship of Prof. R. O. Kapp (United Kingdom). Good progress was made with the revision of I.E.C. Publication 76, Power Transformers, and working groups were set up to draft proposals for chopped-wave tests and for multi-winding transformers. It is hoped that after one further meeting a complete draft of the revision will be ready for circulation under the six months' rule.

*Rectifiers.* (Secretariat: Switzerland). — This committee is at present dealing with monocrystalline semiconductor (e.g. germanium and silicon) rectifier cells, stacks, assemblies and equipments for " power " purposes, i.e. 10 W and over per cell. Rectifiers for use in telecommunications equipment and in measuring devices are excluded, these being dealt with by another committee.

The committee felt that these semiconductor devices were still in the development stage and that it was premature to make firm recommendations for standards. Nevertheless, it was therefore decided that the draft dealing with the past few years' work should be issued (after approval under the six months' rule) as an interim report. It was expected that the report would be further revised in about three years' time when it would be possible to issue firm recommendations. In the meantime the committee will be considering draft standards for mercury arc invertors.

*Nomenclature.* (Secretariat: France). — This committee is responsible for the International Electrotechnical Vocabulary, the second edition of which is well under way. It is being published in several separate parts, so that each section can be issued as soon as it has been completed. More than half of the sections have already been published and others are at the printing stage. A few sections, including those on telecommunications and on nuclear energy are not yet so far advanced. Many other I.E.C. technical committees are also concerned with the question of terminology, and at the meeting in Madrid some directives were drawn up for securing effective liaison between the Nomenclature Committee and other technical committees.

*Graphical Symbols.* (Secretariat: Switzerland).—This committee, like that on Nomenclature, covers a wide field and proposes to issue its recommendations section by section as each one is completed. Sections dealing with symbols for (i) elements of tubes, valves and rectifiers, (ii) switchgear, and (iii) measuring instruments and electric clocks, had previously been circulated under the six months' rule. Several comments had been received, and these were discussed in Madrid with the result that amended lists of symbols will now be circulated for final approval under the two months' procedure. Working arrangements were agreed with the secretariat of the committee on Electrical Installations in Ships for dealing with symbols of interest to that committee.

*Hydraulic Turbines.* (Secretariat: U.S.A.). — This committee is engaged on the preparation of two codes for acceptance tests for hydraulic turbines and associated equipment, the one dealing with field tests and the other with tests using laboratory models. The latter is more advanced than the field test code, and in fact the model test code has now been completed subject to final editing. Two new working groups were formed to deal with acceptance tests for storage pumps and for governors.

*Electric Traction Equipment.* (Secretariat: France).—

This committee works in very close collaboration with the International Union of Railways (U.I.C.) with the result that the decisions of the I.E.C. are almost always adopted by the U.I.C.

A revision of I.E.C. Publication 48, Rules for Traction Motors, was completed in Madrid, and the draft will now be circulated under the six months' rule. A general discussion took place on a draft of rules for the testing of electric rolling stock on completion of construction and before being put into service, and in the light of this discussion the secretariat will prepare a new draft for consideration at the next meeting.

*Insulating Materials.* (Secretariat: Italy).—The full technical committee did not meet, but in Madrid there was a meeting of the Steering Committee to review the progress made by the various working groups dealing with methods of test for specific properties of insulating materials. Documents on methods of test for electric strength, insulation resistance, conditioning for IR tests, tracking, and thermal endurance of enamelled wire are in various stages of progress, but the working groups on discharges and on the effects of radiation on insulating materials had not yet produced drafts. It was decided to set up a new working group on "miscellaneous properties," and as many of the tests involved will be of interest also to the I.S.O. committee on Plastics this new working group will be made responsible for reviewing proposals emanating from the I.S.O. committee.

*Switchgear and Control Gear.* (Secretariat: Sweden).—This committee works through two sub-committees dealing respectively with high-voltage and low-voltage equipment. Both these sub-committees met in Madrid and presented reports to the main committee, with the result that the latter approved three documents for circulation under the six months' rule, these being:—Amendments to the I.E.C. publication (No. 56-1) on oil circuit-breakers, the amendments relating to the asymmetrical breaking capacity of circuit-breakers; guide to the testing of circuit-breakers with respect to the switching of overhead lines on no-load; and recommendations for low-voltage distribution switchgear.

A document on rules for a.c. isolators and earthing switches, which had previously been circulated under the six months' rule, was reviewed in the light of comments received and an amended draft will now be circulated for final approval under the two months' procedure.

Discussions also took place on a draft guide to the testing of circuit-breakers with respect to the switching of cables on no-load, and on draft rules for rating and testing circuit-breakers with respect to the switching of capacitor banks. The secretariat will prepare revised drafts of both these documents in the light of the discussion, and these will be considered at the next meeting. A Working Group was set up to study the question of permissible over-voltages when switching capacitive currents.

*Electrical Installations in Ships.* (Secretariat: Netherlands).—This committee, which is under the chairmanship of Mr. G. O. Watson (United Kingdom) has several sub-committees which attract a large number of delegates. This group of committees in a sense constitutes a separate conference on its own, dealing with a rather specialised subject. The committee is engaged in revising I.E.C. Publication 92, Electrical Installations in Ships, and the new edition will be issued in several separate parts, some of which are approaching the stage when they can be circulated under the six months' rule.

*Electric and Magnetic Magnitudes and Units.*—(Secretariat: France).—It was reported at the meeting of this committee that the proposal regarding the sign for reactive power, which has been under discussion for some years, has now been approved under the six months' rule and will shortly be issued as an I.E.C. Recommendation to the following effect:—"The positive sign shall be given to the reactive power absorbed by an inductor. The use of the adjectives 'inductive' and 'capacitive' is not necessary in connection with the term *reactive power*."

A table of conversion factors for passage from various C.G.S. systems to the M.K.S.A. system of units was approved for circulation under the six months' rule. This table will form part of the I.E.C. Recommendation on the rationalisation of the electromagnetic field equations. A proposal that the name "Giorgi" be given to the M.K.S.A. system of units was approved for circulation under the two months' procedure.

The I.E.C. has been concerned with the subject of magnitudes and units since about 1910, carrying on the work previously done by other bodies, and in particular by the British Association and various electrical congresses. The recommendations made by the I.E.C. have never been brought together into a single document, but in Madrid consideration was given to a draft of such a document, giving a review of the historical development of magnitudes and units. This draft was agreed in principle, referred to an editorial panel, and publication should result in the near future.

*Insulation Co-ordination.* (Secretariat: France).—The I.E.C. has already issued a document on insulation co-ordination (Publication 71) which aims at formulating the conditions to be fulfilled by the insulation of the various categories of equipment making up a complete installation. An "application guide" (code of practice) is at present under discussion and, as a result of the Madrid meeting, this guide will be ready in a few months' time for circulation under the six months' rule. A drafting panel has been set up to prepare the final text, and special steps will be taken to secure liaison with the technical committee dealing with Lightning Arrestors. This was regarded as particularly important because the references to lightning arrestors in the draft guide as it stands are not wholly acceptable to the manufacturers.

*Lamps and Related Equipment.* (Secretariat: United Kingdom).—This committee has four sub-committees, all of which met in Madrid and made such good progress that 11 documents were approved for circulation under the six months' rule. Six of these are "standard sheets" giving the dimensions of various types of lamp caps (photo-flash, automobile and other types), and one is a "standard sheet" for glassware for lighting fittings. The other documents relate to tungsten filament lamps for general lighting service, tubular fluorescent lamps for general lighting service, ballasts for fluorescent lamps, and photographic projector lamps.

*Primary Cells and Batteries.* (Secretariat: France).—This committee met under the chairmanship of Mr. F. Aufenast (United Kingdom) and is engaged in a revision of I.E.C. Publication 86, which is substantially the same as the series of British Standards for dry cells and batteries, B.S. 397, 966 and 1766, currently being revised.

*Insulators.* (Secretariat: Italy).—Work has now been completed on specifications for bushing insulators for voltages above 1,000 V a.c., and for ball and socket couplings of string insulator units, and these are now going forward for publication. A draft specification for post insulators has been approved for circulation under the six months' rule, and a specification for support insulators is still under discussion. The thermal shock

testing of large insulators is amongst the subjects proposed for future study.

*Lightning Arrestors.* (Secretariat: Sweden). — This committee met under the chairmanship of Mr. J. S. Cliff (United Kingdom). The I.E.C. specification for lightning arrestors will be issued in two parts, and Part 1, dealing with non-linear arrestors, has already been published (I.E.C. Publication 99-1). Part 2, covering expulsion arrestors, was reviewed in Madrid and has been approved for circulation under the six months' rule.

The committee briefly reviewed the draft application guide on insulation co-ordination which is referred to earlier in this report, and came to the conclusion that some of the statements in the guide relating to lightning arrestors were misleading to users and embarrassing to manufacturers. It was therefore agreed that special steps should be taken to collaborate with the committee on Insulation Co-ordination, with a view to the text of the guide being suitably modified or all references to lightning arrestors being deleted from the guide and being replaced by an appropriate section in the specification for lightning arrestors.

*Electronic Tubes and Valves.* (Secretariat: Netherlands).—This committee works through two sub-committees, one dealing with tubes and valves and the other with semiconductor devices. The drafts approved for circulation under the six months' rule relate to additions or amendments to be made to the "standard sheets" in I.E.C. Publication 67, dimensions of electronic tubes and valves, and to a system of numbering of electrodes, the measurement of hum and hiss, a code of practice for the preparation of drawings of tubes and valves, outline drawings of picture and oscilloscope tubes, the measurement of direct inter-electrode capacitance of tubes and valves, and the essential ratings and characteristics of semiconductor devices.

*Electric Fans.* (Secretariat: India).—This was the first meeting of a new technical committee, and the discussion centred mainly on draft specifications for table and ceiling fans of the domestic type. The drafts prepared by the secretariat were largely based on the corresponding British Standards (B.S. 380 and 367) and were therefore to a large degree acceptable to the United Kingdom delegation.

*Electrical Equipment of Machine Tools.* (Secretariat: Switzerland).—This was also the first meeting of a new technical committee, and the first part of the meeting was concerned with the scope of the work to be covered. It was decided that the I.E.C. recommendations should be drawn up in two parts, dealing respectively with general purpose machines as defined by the I.S.O. and with special machines. The possibility of having to take computers also into account at some future date was visualised, and the committee expressed a wish to be represented at the conference which the I.E.C. and I.S.O. will jointly call on the subject of automatic data processing. There was a detailed discussion of a draft specification prepared by the secretariat on the basis of the British, German, American and other national standards. Written comments had been submitted only by France and the United Kingdom, and it was eventually decided to appoint a committee of experts to study the draft in greater detail and to review any further written comments that might be submitted.

## Le Maistre Lecture

A series of visits to factories and other places of technical interest was arranged for the benefit of those delegates who could take the necessary time off. Excellent arrangements were made for the entertainment of the delegates and their ladies.

The Le Maistre Memorial Lecture is now established as one of the most important events at the annual grouped meetings of the I.E.C. The object of the lecture is primarily to perpetuate the memory of the outstanding services given to the I.E.C. by Charles le Maistre in the course of the 49 years during which he held office as general secretary. The 1959 lecture, the fifth in the series, was prepared by Mr. A. M. Nekrasov, Deputy Minister of Power Stations in the U.S.S.R., but as he was unable to go to Madrid the lecture was read on his behalf by Mr. B. P. Lebedev, leader of the U.S.S.R. delegation. The title of the lecture was "International Standardisation and the Development of Economic Relations Between Countries," and it was delivered, in English, in the magnificent lecture hall of the Trades Union Building. After elaborating the theme that the level and state of standardisation in a country characterises the development of industry in that country, and paying tribute to the spirit of co-operation that exists at meetings of I.E.C. committees, the lecturer said that mass production, enormous markets and commercial operations demand special methods of working out requirements for industrial goods for the international market. The U.S.S.R. therefore supports the extension of trade among all countries irrespective of their social economic systems.

At present the Soviet Union exports such goods as boilers, thermal power stations with units up to 50 MW capacity, hydro-electric units up to 10 MW capacity, electric locomotives, small transformers, electric motors and welding equipment. At the same time much equipment is imported by the U.S.S.R., and this two-way foreign trade is greatly facilitated by the degree to which the contracts can be based on I.E.C. recommendations. These, as well as the working documents and drafts circulated by the I.E.C. Central Office, are widely used in the U.S.S.R. when preparing new or revised standards. Moreover, the procedure for preparing standards in the U.S.S.R. is largely based on I.E.C. procedure.

The lecturer went on to describe in some detail the system of standardisation adopted in the U.S.S.R. for motors and generators, quoting this as an example of the way the work of the I.E.C. is progressively helping to smooth out the technical barriers to international trade.

## Power Reactor Technology

A COLLECTION of 17 papers presented by the U.K.A.E.A. to the Second Conference on the Peaceful Uses of Atomic Energy in September, 1958, has been published in book form under the title of "The Technology of the Gas-Cooled Power Reactor and Related Subjects." The papers are devoted to various aspects of the technology and economics of the gas-cooled graphite-moderated power reactor developed in the United Kingdom, describing the work carried out in advancing from Calder Hall to the civil power stations now under construction or being planned. The subjects covered include re-design and operating experience at Calder Hall, safety aspects, the problems of fuel, development of manufacturing techniques for fuel elements and advances in reactor design. Several of the papers deal with recent experience and current plans, though in most the various authors are describing work which forms the background to reactors being installed in this country and offered for export abroad.

The book was produced primarily for distribution to overseas organisations likely to be concerned with the development of nuclear power, but a limited stock is still held by the Authority. Requests for copies from organisations will be considered by the U.K.A.E.A. Public Relations Branch, 11, Charles II Street, London, S.W.1.

# Recent Lighting Developments

THE "Popular Pack" fluorescent fitting manufactured by Atlas Lighting, Ltd., Thorn House, Upper St. Martin's Lane, London, W.C.2, now appears in a slimmer and lighter form and at reduced prices. The completely enclosed fitting, available in 8, 5, 4 and 2ft sizes, has a cover plate removable from below to give access to the wiring and control gear, and spring-loaded bi-pin lamp holders which permit the replacement of the tube from either end. The fitting is normally supplied for use on 230/250 V mains but it can be obtained for operating on 200/210 or 220 V supplies.

Four reflector and diffuser attachments are available, purchasable separately or fitted with chassis and tube, including an open-end metal trough reflector with upward-facing slots for the 5ft and 8ft sizes, a one-sided angle metal reflector for the 5ft fitting, a diffuser in extruded "Diakon" with blue plastic end panels clipped directly to the tube in the 5ft fitting, and a translucent closed-end opal "Perspex" trough. The new pack will be supplied against all future Atlas "Popular Pack" orders.

New slim "Popular Pack" fluorescent fittings are also announced by Ekco-Ensign Electric, Ltd., Preston House, 45, Essex Street, Strand, London, W.C.2. The 2, 4, 5 and 8ft enclosed battens have a cross-section of only 2½in by 1¼in and they can be used, either ceiling mounted or suspended, as battens or with easily attached slotted reflectors, angle reflectors, "Perspex" reflectors or diffusers. The fittings are supplied with a white or warm white fluorescent tube. The 8ft units are suitable for operation from 230/240 or 250 V supplies and the 5ft, 4ft and 2ft units operate on 230/250 or 200/210 V, though for these sizes 220 V fittings can be supplied.

The "New-Range" fluorescent lighting fittings manufactured by Crompton Parkinson, Ltd., Crompton House, Aldwych, London, W.C.2, now include a variety of 8ft units. One- or two-lamp industrial reflectors are available which, by the addition of standard components, can be either closed or open type, closed or open ended. These fittings can be attached to "New Line" lighting trunking.

## Street Lighting

Two street lighting schemes at Twickenham and Leicester utilise a 100 lm/W low-pressure sodium lamp known as the "Mazda 200 W Sodium Linear," developed by the A.E.I. Lamp & Lighting Co., Ltd. Incorporating pre-heated electrodes, the lamp starts and operates from a 320 V supply, the control gear being no bigger than that used for a conventional 140 W lamp. Crescent sections formed in the arc tube provide a directional light output a third greater sideways than downwards. The lamp is being marketed in conjunction with the "Amberline" lantern, which may be mounted at heights between 25 and 35ft and spaced at 120 to 200ft intervals. The lantern incorporates an integral canopy and bowl of grey and clear "Perspex," and the light control is by refractor plates sealed on to the bowl interior.

An experimental installation of 280 W sodium lamps developed by Philips Electrical, Ltd., was recently put into service on a ¾-mile stretch of the main A.8 Glasgow-Edinburgh road at Ballieston. The dual carriageway, with two 30ft wide roadways and a 30ft central reservation, is illuminated at levels ranging from 2·23 lm/sq ft under the lanterns to 0·63 lumens by 52 lamps mounted at a height of 35ft with an 8ft overhang from the kerb.

Two types of lantern have been used in a 12-column installation on the Coventry By-Pass, both manufactured by Siemens Edison Swan, Ltd. The first is part of the "Kuwait" unitary system, the "Coventry Osprey," and incorporates one 200 W linear sodium lamp, providing a 20,000 lumens light output, mounted at a height of 35ft with 150ft column spacing. The lanterns may be tilted up to 20 deg to ensure correct light distribution.

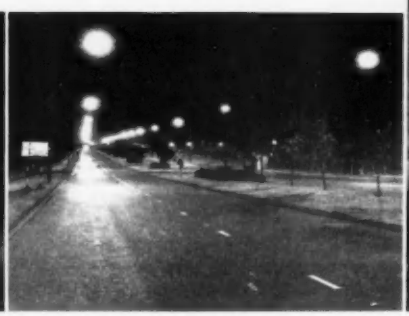
The second lantern, known as the "Coventry Oline," houses one or two 200 W linear sodium lamps and in this installation, on a dual carriageway comprising two 20ft roadways, an 18ft central reservation and two 8ft cycle tracks, they are mounted at a height of 35ft set at a staggered 100ft spacing. This section can be switched to demonstrate the use of one lamp only in each lantern and the angle of the main beams may be adjusted. When mounted at 25 to 35ft above the ground with 150ft spacing, the illumination provided by the "Osprey" and the "Oline" (with one or two lamps operating) is 9,100, 10,900 and 21,000 lumens per 100ft linear below the horizontal respectively.

## Magnetic Circuit Steel

THE first part of the latest edition of B.S. 601 "Steel sheets for magnetic circuits of power electrical apparatus"—first published 24 years ago—deals with non-oriented magnetic steel sheets and strip intended primarily for machines operating at power frequencies. It applies to material normally supplied in the fully processed condition, which at the option of the purchaser may be carried out on one side only or on both, unless specifically ordered by the purchaser to be supplied in another form. Four appendices to the 24-page specification deal with the method of testing total losses and total excitation, magnetisation measured by d.c. reversals, typical values for stacking factor and for the effect of ageing, and bend testing to determine brittleness.

Copies may be obtained from the sales branch of the British Standards Institution, 2, Park Street, London, W.1, price 6s.

*Left: "Mazda" 200 W linear sodium lamps in A.E.I. "Amberline" lanterns at Chertsey Avenue, Twickenham. Centre: The Edinburgh-Glasgow road at Ballieston with Philips sodium lighting. Right: Siemens Edison Swan "Osprey" lanterns on the Coventry By-Pass*



# VIEWS on the NEWS

*By REFLECTOR*

ASH disposal is a problem of some magnitude for the operators of large modern coal-fired power stations but it is one which the Central Electricity Generating Board and its predecessors seem to have tackled successfully. Several stations are thus providing material for building purposes and I have recorded an instance in which ash has been used to fill in old chalk quarries. *Dragonpower* (the magazine of the C.E.G.B. South Wales Division) included in its June issue an article by Mr. F. W. Gair on what has been done with the p.f. ash from the Uskmouth power station. Altogether since the station was commissioned 700,000 tons of ash has been deposited on 50 acres of land adjoining the station, raising the level by 18 feet. The new surface has been turned into good pasturage and, to quote the title of the article, "Sheep (and cattle) may safely graze."

* * *

Though I have never done anything about it, I have often felt that a few lighting fittings installed in the garden would be an added attraction and I was therefore interested to read an article on this subject in *Electrical Construction and Maintenance* (New York). The writer considers that there is a "huge market potential" for outdoor residential lighting in America. Most lighting equipment of this kind at present in use is installed for safety purposes and consists of reflector floodlights to illuminate steps and paths, but there is a growing demand for post lamps. A photograph shows how these can be both decorative and useful, illuminating flower borders and paths. Lack of the initial wiring installation in the garden is the chief limiting factor and the writer says that future development depends largely on greater co-ordination among contractors, lighting equipment manufacturers and utility companies in making available information on types of system and services required.

* * *

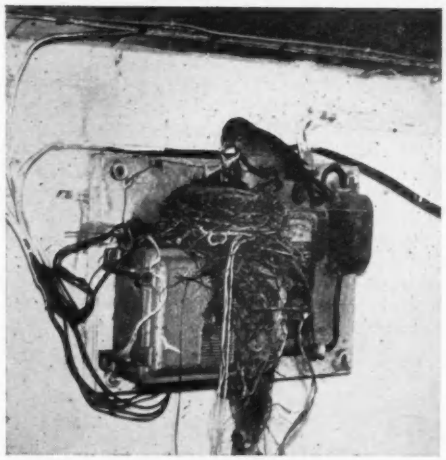
In announcing that "Whirlwind I," "once the largest, fastest digital computer in the nation," has ceased operation, the Massachusetts Institute of Technology gives an assurance that its memory is not failing through senility (it is less than eight years old); it is being pensioned off because younger and faster computers have come along. There is a poignancy about this which almost awakes sympathy for this "electronic brain" whose career, while much shorter, is strangely comparable with that of a human being.

* * *

A recent *Reuter* message from New York said that scientists at a United Nations conference were told that "a woman talking to a fleet of cabs on a short-wave radio unwittingly caused an American missile to explode prematurely in space." The pitch of the woman's voice is said to have coincided with the emergency radio signal arranged to destroy the missile in case of necessity. I am familiar with the "talk down" system employed at airports; is it conceivable that in future missiles may be talked down by a special female branch of Civil Defence?

* * *

The photograph reproduced herewith appeared recently in *Pulman's Weekly News*, Yeovil. The aim was to show the nest built by a bird upon a meter and switch-box in



the Orchard Street garage of the Yeovil and District Co-operative Society. But it also reveals a pretty piece of wiring which is almost indistinguishable from the nest.

* * *

In the latter half of last century the *Electrical Review* conducted a prolonged campaign against a Mr. Harness who was selling an "electric belt" for which remarkable curative properties were claimed. One result was an unsuccessful libel action which was quite a *cause célèbre* at the time and strengthened the *Review's* reputation. I have come across one of the attacks on Harness in the issue of 23rd August, 1883. It took the form of a review of a book by a Mr. A. E. Baines in which both the belt and the author were castigated. I quote the opening paragraph:—

> "On reading the effusion by Mr. A. E. Baines, 'late editor of the *Electrical Engineer*, and late assistant editor of the *Electrician*,' two thoughts occurred to us: first, that these papers have lost but little by having made other arrangements in connection with their staff; and, secondly, a feeling of pity that anyone who occupied the position that the gentleman in question is stated to have held could lend himself to the puffing of electro-medical appliances of the kind. Did this gentleman really believe that the apparatus which he advocates were really of a genuine character, we might criticise his arguments merely, but as the case stands we cannot do less than express disgust."

# LETTERS TO THE EDITOR

*Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.*

## Recruitment of Professional Electrical Engineers

MAY I congratulate you and your various subscribers on the attention paid to the subject of present conditions of admission into the I.E.E. Many members have expressed their concern during recent years, but any action must come from within, since any prompting by those without will automatically be discounted as sour grapes.

The views of Mr. J. W. Thomas regarding H.N.C. (*Electrical Review*, 14th August) are endorsed by the present attitude of private employers, who in recent years have tended less and less to insist on I.E.E. qualifications and are prepared to assess the man for themselves. On several occasions I have had it confirmed that in doing this they can usually expect to find a good engineer who will keep both feet on the ground.

Presumably the I.E.E. is now so large that it runs the risk of becoming unwieldy, and its policy is to restrict membership to those having the highest academic qualifications. This may be the ideal, but in practice there are at least two results which I cannot imagine were ever intended. The first is this drifting away from accepting the standards laid down by the Institution and, secondly, that there are several other engineering bodies, some quite old and well-established, who are daily gaining good members and consequently increasing stature as the result of the present policy.

As Mr. R. A. Locke says, engineering degrees alone do not make a man a manager. This, however, is a separate subject for a future occasion. The first important thing is to bring home to the I.E.E. the current trend of opinion and the likely results of its present policy.

*Brighton.* L. T. GRIFFITH.

## Polythene v. Polyethylene

THE ever-increasing use of plastics is introducing to the public many new names for different materials. It is doubtful whether many people are yet able to distinguish between the properties of the various plastics which are now on the market, and it would seem foolish to foster confusion by the use of two names for the same product. This is, however, happening as the names " Polythene " and " Polyethylene " are both in general use.

The term " Polyethylene " was apparently evolved in America under a mistaken impression that the name " Polythene " was a registered trade name in the United Kingdom. It is felt to be high time this error was corrected and the polythene film manufacturing members of this Association, which represents all the principal makers, have agreed that they will use exclusively the name " Polythene."

It is hoped that all who have interests in the manufacture and sale of polythene products will follow the same course and so help to avoid any risk of confusion in the mind of the public.

*Sheffield, 10.* PEAT, MARWICK, MITCHELL & Co.
*Secretaries,*
Packaging Films Manufacturers' Association.

# NUCLEAR DEVELOPMENT AND INDUSTRY

A RECOMMENDATION that the United Kingdom Atomic Energy Authority should work more closely with industry is made in the Select Committee on Estimates' Report on the Production Group and Development and Engineering Group of the Authority (H.M.S.O., price 5s).

The Committee's main impression is that the Industrial Group has carried out its tasks with efficiency and success. The principal function of the Group, it states, is to create and develop new systems. It therefore thinks it undesirable that the Group should be required to devote continuing and large-scale effort to the achievement of marginal improvements in the operating performance of systems which it has developed in the past. The Committee recognises that the primary responsibility for the development of civil nuclear power plant lies with the Authority who must exercise a strong central guidance to ensure that the limited resources of this country are not dissipated. But it points out that the consortia have had some years of experience and have built up their own research, design and development teams. With spare capacity available, they were eager to be given more opportunity to make an original contribution to this new technology.

The Committee believes that the Industrial Group should respond to this changed situation by bringing industry into closer partnership at every stage of development. In the first place, the proportion of the nation's nuclear engineering and scientific skill that the Authority can recruit is limited and the volume of work to be done is expanding. Secondly, it is desirable so that the resources available in industry can be economically employed. It would be wasteful, it states, to leave the nuclear engineering industry under-employed, as it is today, while work it could have done is being postponed by the Authority. Thirdly, industry should take on more work so that it may more quickly acquire the ability to originate and exploit nuclear developments itself.

The Committee believes that a gradual development along these lines would lead to economy in public expenditure. It also recommends that the Group should invite the consortia to attach a limited number of people to the experimental reactor projects and that if no experimental reactor is to precede the prototype stage the consortia should be invited to join the group in technical discussions as soon as feasibility studies are complete.

The Committee states that the value of research and development which the Authority will place with industry should treble within the next few years. The extra-mural expenditure by the Dounreay Establishment should increase tenfold. There is, however, less agreement on the extent that the consortia should be given contracts for the development of whole reactors.

In surveying the work of different reactor systems the Committee recommends that the priority of the fast reactor projects at Dounreay should now be given special consideration. It criticises as the " least satisfactory feature of this record " the way expenditure on this project has drifted up and the estimate revised upwards three times in four years until it was now 38 per cent above the original. Inadequate control here is believed to have cost £500,000.

# Progress at Hinkley Point

WE recently visited the Hinkley Point nuclear power station being built for the Central Electricity Generating Board by the English Electric, Babcock & Wilcox, Taylor Woodrow Atomic Power Group. At present it would seem that, as planned, the station will be completed in 1962.

So far most work has been done on the civil engineering side. A major contribution to the civil engineering progress was the recent (20th June) installation by Taylor Woodrow Construction, Ltd., at a point 2,000ft offshore of the cooling water intake caisson, a 90ft diameter cylinder through which water will flow at the rate of 35 million gal/hr. It is 60ft high and is supported on the sea bed on eight 68ft long, 4ft diameter, adjustable steel "spud legs," a technique believed to be unique in power station construction.

The main biological shield of the first reactor is complete and stands 100ft above the general station level with the supplementary shields rising above it. Work on the foundations for the shields began in mid-January, 1958, and 40,000 cu yd of high quality concrete has been placed in the foundations and shields. The biological shields of the second reactor are now nearing completion.

The contract starting date for the station was December, 1957 and, by early January, the initial task, involving the excavation of 200,000 cu yd of shale and limestone, was practically complete. Twin reinforced concrete subways have been built for conveying the h.v. cables from the turbine house to the 275 kV switchgear compound south of the main station.

Heavy plant and equipment is brought from the works (in Scotland and the North) to the site mainly by sea. At Combwich, four miles from the main site, a wharf capable of handling ships of up to 1,500 tons was constructed during the first six months.

Before construction of the turbine house and cooling water system, with its associated pumphouse and tunnels, could be started it was essential to complete the first 2,500ft of the 3,500ft-long sea wall. Work on this wall began in December, 1957, and 19,000 cu yd of concrete was placed in tidal working conditions.

Some 100,000 cu yd of rock has been excavated for the turbine house, and construction of the basement is in progress. The construction of the turbine blocks is also under way. The pumphouse was excavated to a depth of 80ft and concreting of the floor and walls is in progress. An 18ft diameter access shaft for the tunnels has been sunk 80ft deep and an access tunnel driven three-quarters of the way to the position of the intake structure 2,000ft offshore. More than half of the driving of the two water tunnels has been done. The 400 ton Goliath crane is now in use.

Work on the site fabrication of the pressure vessel for No. 1 reactor is well established, and the first section consisting of Nos. 1 and 2 courses and the supporting skirt will shortly be moved from the fabrication area to its position in the biological shield. This will be one of the first major tasks of the Goliath crane. Similar progress is being made on the fabrication of the steam-raising units. The shell of the first of the twelve 90ft high units, each weighing well over 300 tons, has been completed and, following X-ray examination of the circumferential welds now being carried out, the shell will undergo a hydraulic test preparatory to being moved and positioned on its foundation plinth alongside No. 1 reactor building. The fabrication of the second steam-raising unit is well advanced, and work has commenced on a third unit.

*Title picture shows the two biological shield structures at Hinkley Point with the pressure vessel fabrication building in the foreground and the foundations of the turbine hall to the left*

# New Books

**Electrical Engineering: Theory and Practice.** 2nd edition. By W. H. Erickson and N. H. Bryant. Pp. 614; figs. John Wiley & Sons Inc.; Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 64s.

This volume covers a very wide range of subjects and is mainly descriptive rather than explanatory. The first chapters are devoted to an elementary treatment of electric and magnetic circuits; unfortunately, there is no reference to the M.K.S. system of units, and the magnetic flux density is expressed in lines per square inch. The text continues with electrostatics, single-phase and polyphase circuits, measuring instruments, d.c. and a.c. machines and transformers, vacuum and gas-filled valves, metal and mercury rectifiers, electronic circuits and control equipment. The new material introduced into this edition is mainly concerned with electronics and includes a very good section on transistors.

From the standpoint of the student who desires a sound foundation in fundamental principles, this volume is disappointing, the treatment being—in general—superficial. Many formulæ are given without any attempt to justify them, and the explanations of the action in many important cases, such as measuring instruments, commutation, etc., are very poor and may be tantalising to the serious student. In Fig. 6.4, the battery is shown short-circuited when the switch is closed and the sequence of the windings in Fig. 19.20 is incorrect.

This book does, however, contain a great deal of useful information presented in a readable style. With the above exceptions, care has been taken over the preparation of the numerous diagrams and these have been very clearly reproduced. Each chapter concludes with a number of problems with answers. Many of these problems are very searching and their solution requires a more thorough knowledge of fundamental principles than is provided by the text.—E.H.

**Fundamentals of Radio & Electronics.** Edited by W. L. Everitt. Pp. 805; figs. Constable & Co., Ltd., 12, Orange Street, London, W.C.2. Price 57s 6d.

This book was first published in 1942 and in this edition the text has been completely revised and enlarged to include a number of new techniques, such as pulse circuits and transistors with their applications. The opening chapter provides a concise summary of elementary mathematics necessary for the understanding of radio and electronics, covering decimals, algebra, trigonometry, vectors and brief mention of calculus. This is followed by an introduction to d.c. circuits, fundamental units, Ohm's law, simple series and parallel networks, batteries, hysteresis effect, d.c. machines and meters. A similar approach covers a.c. theory including vectors or the more descriptive term phasors; mention is made of impedance matching and transformers. Numerous step by step examples are included in these chapters.

The major portion of the text is devoted to basic radio theory dealing with the application of valves and transistors. The section on audio and video amplifiers is extensive although descriptive with basic formulæ and numerous diagrams. Pulse and switching circuits as used in radar and computers are treated in outline with such standard circuits as multivibrators. Transmission and the recording of sound is rather out of sequence being before general circuit theory and the treatment is inadequate. Nearly two hundred pages—Chapters 9-13—are devoted to electromagnetic waves, transmission and reception, detectors, r.f. amplifiers, modulators, a.m. transmitters and receivers. Following chapters deal with frequency modulation and television, the latter divided into monochrome and colour. The basic theory requires a higher standard of knowledge than for the previous chapters, but the text gives a good background in television fundamentals. The circuits given apply to the American systems only, which is a pity for a book devoted to fundamentals.

A section headed "Vacuum Tube Instruments" covers test equipment, and this is most welcome in a book of this nature as many engineers lack appreciation of the pitfalls of measurement technique and the limitations of the apparatus being used for a particular investigation. Instruments described include r.f. signal generators, oscilloscopes, "Q" meters and valve voltmeters. Microwave and u.h.f. theory are dealt with in detail, also klystron and magnetron oscillators. Wave propagation and aerials are given a general description, with simple types of arrays and coupling networks between transmitter or receiver and aerial. Both principles and application of radar and navigational aids are treated, but no mention is made of the British "Gee" and Decca systems. The last chapter deals with industrial applications of electronics including r.f. heating, diathermy, servo-mechanisms, etc. The appendix deals with emergency and special radio services applicable only to America.

This book should be invaluable to the electrical engineer who needs an introduction to electronics. At the end of each chapter there are examination questions. The text is well written with diagrams and photographs. The technical standard varies throughout but this is bound to occur in a volume with several contributors.—J.G.

**Progress in Dielectrics.** Vol. 1. Edited by J. B. Birks and J. H. Schulman. Pp. 312; figs. 139. Heywood & Co., Ltd., Carlton House, Great Queen Street, London, W.C.2. Price 70s.

This is the first volume in an annual series being prepared by two joint editors, Dr. J. B. Birks of Manchester University and Dr. J. H. Schulman of the United States Naval Research Laboratories, to provide a common pool of knowledge concerning dielectric phenomena, materials and techniques for all those interested in dielectrics—the electrical and electronics engineer, the physicist, molecular chemist and the biologist—and to review recent progress in this field. Some eight surveys of the present state of knowledge in selected aspects of the principal subject are to be included in each volume, many of the articles containing original work. Contributions are taken from any country in which relevant work is being carried out, the authors being expert in a particular field.

The emphasis in the first four articles in this volume is on dielectric breakdown and on the insulating properties of solid, liquid and gaseous dielectrics. J. H. Mason deals with dielectric breakdown in solid insulation, J. W. Davisson discusses directional breakdown effects in crystals, T. J. Lewis considers the electric strength and high-field conductivity of dielectric liquids and T. W. Liao and R. E. Plump review gaseous dielectrics. These are followed by a classification by A. D. Franklin of ferroelectricity of barium titanate single crystals, and non-oxide ceramic dielectrics are reviewed by P. Popper. Finally, J. B. Birks describes the electrophoretic deposition of insulating materials.—T.R.W.

# PERSONAL AND SOCIAL

*News of Men and Women of the Industry*

The United Kingdom Atomic Energy Authority has appointed **Mr. J. B. Adams** to be director of a new establishment to deal with controlled thermonuclear research. The work in this field now being done at Harwell, and some of the work now being done at A.W.R.E., Aldermaston, will be moved to this new establishment. Mr. Adams is at present director of the Proton-Synchrotron Group of the European Council for Nuclear Research (C.E.R.N.) near Geneva. He will take up his appointment with the Atomic Energy Authority towards the end of 1960.

The Council of Industrial Design announces the appointment of **Mr. J. Noel White** to be deputy director as from 1st January, 1960, when **Mr. P. Reilly**, the present deputy, succeeds Sir Gordon Russell as director of the Council.

The Minister of Power has appointed **Mr. Winston Brimacombe,** O.B.E., to be a part-time member of the South Western Electricity Board. Mr. Brimacombe is managing director of E. Dingle & Co., of Plymouth, and of its subsidiary companies. He is a member of the West Region Advisory Council of the B.B.C. and a member of the Council of the Retail Distributors' Association.

*Mr. W. Brimacombe*

Three new appointments have been made in the English Electric Co.'s export organisation following that of **Mr. L. H. Short** as director of overseas operations.

**Mr. J. F. Herbert,** B.E., M.I.E.E., has been appointed general manager, export sales. He has been with the company since 1930 and for the past two years he has been manager, overseas atomic projects, and he will continue his interest in this sphere. He is also a director of the English Electric Export & Trading Co. After taking a Bachelor of Engineering degree at Sydney University, Mr. Herbert joined the English Electric Co. as a graduate apprentice and after further training he was sent out on a sales mission for six months to West Africa and later became the company's technical representative for Malaya, in 1936. On the outbreak of war he was commissioned in the local volunteer forces in Malaya, and was taken prisoner in Singapore. In 1945 he returned to England, and two years later returned to Singapore as manager (Far East) for the company, in which post he remained until 1953 when he returned to the United Kingdom on his appointment as export area manager for Australasia and the Far East.

**Mr. S. E. Bolton,** M.Eng., A.M.I.E.E., has been appointed to the newly created post of assistant general manager, export sales, for the English Electric Co., Ltd. He has been with the Export Department since 1945, initially dealing mainly with Europe and North and South America. In the last five years as area manager for the North American continent, he has been concerned with the negotiation of contracts with the United States for heavy plant and equipment. Mr. Bolton graduated from Liverpool University in 1928, and after a two-year college apprenticeship with Metropolitan-Vickers was for a period with that company's Export Division. In 1941 he joined the Ministry of Supply where he later became assistant director of electricity supplies.

**Mr. S. W. J. Butler,** B.A., A.M.I.C.E., who has been appointed to the newly created post of manager, Overseas Factories Department, joined the company as an apprentice at Rugby in 1936. On completion of his apprenticeship he took up an appointment with the English Electric Co. in India. He joined the Royal Engineers in 1939 and served throughout the war, mostly in the Middle East, attaining the rank of major. After the war he rejoined the company in the Export Department. From 1948 to 1950 he was personal assistant to the chairman and managing director, and for the last eight years has been in charge of overseas factories services.

Belling & Co., Ltd., announce the appointment of **Mr. R. P. Dean** and **Mr. G. K. Coldwell** as directors. Mr. Dean joined the company in 1936, having received his early training with the General Electric Co., Ltd. He was appointed export manager in 1948 and became deputy sales manager in 1958.

Mr. Coldwell joined the company in 1953 as production engineer and was appointed deputy works manager in 1958. He was previously with Radiation, Ltd., Jury Holloware, Ltd., and the General Electric Co., Ltd.

*Mr. R. P. Dean*

*Mr. G. K. Coldwell*

The Eastern Electricity Board has appointed **Mr. W. M. Bishop,** B.Sc. (Eng.), A.M.I.E.E., A.M.I.Mech.E., A.M.B.I.M., at present the commercial officer of the Chilterns Sub-Area, to be manager of the Norfolk Sub-Area in succession to **Mr. J. A. Sumner,** who retires at the end of this year. Mr. Bishop, who, before going to Bedford as the sub-area commercial officer, was the manager of the E.E.B. Hemel Hempstead District, was educated at Portsmouth Grammar School and also at King's College, London University. While at the university he became a student apprentice to the British Thomson-Houston Co. He subsequently held appointments at Portsmouth, Gosport, Bedford and Hoylake. In 1947 he was appointed deputy city electrical engineer and manager at Exeter.

*Mr. W. M. Bishop*

**Mr. R. F. Campbell,** A.M.I.E.E., formerly station superintendent at Ocker Hill power station, has been appointed generation engineer, Midlands Division, of the C.E.G.B., in succession to **Mr. H. Bancroft,** who is transferred to the East Midlands Division. **Mr. T. Howard,** A.M.I.E.E., A.C.T.(B'ham), formerly deputy station superintendent at Hams Hall "B" power station, has been appointed station superintendent of Nechells "A" and "B" power stations.

Both Mr. Campbell and Mr. Howard served with the former Birmingham Corporation Electricity Supply Department as trainees, and later held various posts in the Birmingham group of stations.

The **A.S.E.E. Golfing Society** held its annual all-day meeting at Wentworth on 23rd July, over seventy members attending. The Liverpool Electrical Cable Co.'s trophy was won by Mr. J. Gibson after a tie with Mr. F. J. Hallett, who was runner-up; the wooden spoon went to Mr. F. Bywaters. Mr. W. Boustead won the tankard for the best visitor's score, Mr. C. Smerthwaite being runner-up. In the afternoon, members paired with visitors playing for the Edmundson trophy. The winning partners were Messrs. W. Newman and E. J. Munn; Messrs. P. McArdle and F. Lucas

were runners-up, while Mr. W. F. Parker partnered by Mr. Cawte won the wooden spoon. At the supper in the evening the president, Sir Josiah Eccles, presented the prizes.

Semiconductors, Ltd., announces the formation of an executive board headed by **Dr. J. Reekie,** executive director and general manager. **Mr. C. H. Noton,** who recently joined the company as commercial manager, becomes commercial executive director. **Mr. E. E. Webster,** central production executive, Swindon region, of the Plessey Co., Ltd., has also been appointed an executive director of Semiconductors.

*Dr. J. Reekie*

Twenty-three competitors took part in the Eastern Area final of the **Electrical Industries National Golf Championship** held recently at Letchworth Golf Club, and the area trophies were presented at a supper which followed the meeting. The successful competitors, who now qualify for the national final at Moortown, Leeds, on 21st September, were as follows:—Winner, Mr. J. L. Taylor (Leighton Buzzard); runner-up, Mr. R. A. Holdstock (Luton). Best scratch score, Mr. S. J. Ball (Letchworth). Those who would like to take part in next year's area competition should communicate with the area secretary, Mr. R. Bruce, Crompton Parkinson, Ltd., 119-121, Dunstable Road, Luton.

**Mr. H. J. Wigner,** A.M.I.E.E., has been appointed sales engineer for Sharp Control Gear, Ltd., for London and the Southern Counties area. For the past three years Mr. Wigner has been electrical engineer with A. D. & D. M. Watson, consulting engineers, and he was previously on the sales staff of Johnson & Phillips, Ltd.

**Mr. R. Y. Sanders,** F.S.S., F.R.Econ.S., F.R.Met.S., who has been deputy commercial and development adviser to the Electricity Council since January, 1958, has decided, for health reasons, to retire from the post on 30th September next.

*Mr. R. Y. Sanders*

Mr. Sanders was one of the first officers appointed to the headquarters staff of the Central Electricity Board on its establishment in 1927, becoming head of the Development and Economic Section. He was also secretary of the Board's National Consultative Committee from 1944 to 1948. In 1948 he became deputy commercial manager to the British Electricity Authority and later deputy chief commercial officer. He was chairman of the Utilisation Research Committee of the Central Authority and the Area Boards from its inception, and is now chairman of the three Utilisation Research Panels of the Electricity Council which have replaced that Committee. He is a member of the Electricity Supply Research Council and of the Council of the Electrical Research Association. For many years he has served on committees of the U.N. Economic Commission for Europe and the O.E.E.C. and on both the Directing Committee and some of the Study Committees of UNIPEDE. Mr. Sanders was a member of the delegation from the supply industry in this country which visited Russia in 1956. His services will remain available to the Council in a consultative capacity.

**Mr. J. C. Lithgow,** C.B.E., resident partner of Messrs. Kennedy & Donkin (East Africa), is leaving Uganda on 13th August to take up an appointment in Washington with the International Bank for Reconstruction and Development. Since Mr. and Mrs. Lithgow arrived in Uganda in January, 1949, Mr. Lithgow has been responsible for the installation of the mechanical and electrical plant at the Owen Falls hydro-electric station of the Uganda Electricity Board. Members of the Uganda Electricity Board gave a small informal farewell dinner party to Mr. and Mrs. Lithgow on 7th August.

Two new district office manager appointments are announced by Siemens Edison Swan, Ltd. They are **Mr. J. Petrie,** who has been appointed district office manager at Dundee and Aberdeen following the retirement of **Mr. W. Gillespie,** and **Mr. J. McGregor,** who takes over from **Mr. E. J. Fairweather,** retiring district office manager at Edinburgh.

Mr. Petrie joined the Aberdeen district office of the Edison Swan Electric Co., Ltd., in 1930. He became manager of Nottingham district office in 1953, and additionally manager of Leicester and Norwich a year later. On the company's integration with Siemens Bros. & Co., Ltd., in 1957 Mr. Petrie was transferred to Dundee as deputy manager of the Dundee and Aberdeen office.

Mr. Gillespie, who is retiring, started with the Edison Swan Electric Co., Ltd., on discharge from the navy in 1917. After promotion to assistant manager of Dundee district office in 1919, he was appointed manager in 1924. When the Aberdeen and Dundee district offices were amalgamated in 1932 his territory covered all Scotland north of the Firth of Forth.

Mr. McGregor, the new Edinburgh district office manager, gained early experience in the radio trade, and studied at the Heriot Watt College, Edinburgh. Shortly after joining the company in 1926 he was made a general representative, a position he has held till his present appointment. Mr. Fairweather has been manager of the branch since it was first opened in 1921.

**Mr. P. K. Brodie,** A.M.I.E.E., M.Amer.I.E.E., has been appointed manager of the Dorking and Epsom District of the South Eastern Electricity Board in succession to the late Mr. C. L. B. White. Mr. Brodie has been with the South of Scotland Electricity Board since 1954 and has been senior assistant commercial engineer with responsibility for all commercial activities in the Fife Area since 1957. He takes up his new appointment with Seeboard on 1st September.

The United Kingdom Atomic Energy Authority announces the appointment of **Air Chief Marshal Sir Claude B. R. Pelly,** G.B.E., K.C.B., M.C., as member (designate) for weapons. Air Chief Marshal Pelly, who is retiring from the Royal Air Force, has been Controller of Aircraft at the Ministry of Supply since 1956. He will take up his new appointment later this year.

**Mr. W. H. Thompson,** M.I.E.E., who writes in this issue on "Safety Interlocking Systems," joined the switchgear factory of the B.T.H. Co., Ltd., at Willesden in 1913 and in 1919 he joined the Switchgear Department of the Metropolitan-Vickers Electrical Co., Ltd., and was one of the original members chosen to start the Met-Vick E.H.V. Division in 1920. From then until his retirement in 1958 he was concerned with the design and application of e.h.v. apparatus and specialised on surge phenomena.

*Mr. W. H. Thompson*

**Mr. E. J. Scotcher,** B.Sc.Tech., A.M.I.E.E., has been appointed factory superintendent at the Huyton Works of the Metropolitan-Vickers Electrical Co., Ltd. Mr. Scotcher was educated at Blackpool Grammar School and the University of Manchester. He served with the R.E.M.E. from 1947 to 1949, and then joined M-V as a college apprentice. On completing his course in 1951, he remained with the company and on the opening of the works at Huyton in 1956 he became assistant superintendent.

The chairman and directors of **Drake & Gorham, Ltd.,** recently gave a private luncheon party at Kettner's Restaurant when some of the company's senior staff were presented with gold watches to mark the completion of fifty years' service with the company. Among the guests were Mr. H. Brown who had celebrated his fiftieth anniversary four years previously and who is now retiring, and Mr. A. A. Clery who, after thirty-seven years with the company, has now retired

from the board of directors. The presentations were made by the chairman, Mr. H. M. Drake.

**Mr. K. T. F. M. Batty,** A.M.I.E.E., A.M.I.Mech.E., has succeeded **Mr. A. E. Kell** as divisional welfare and education and training officer in the South Western Division of the Central Electricity Generating Board as from 1st July.

*Mr. K. T. F. M. Batty*

Mr. Batty served his apprenticeship with John Thompson Water Tube Boilers, Ltd., and after a period at Worcester power station joined the Central Electricity Board, South Western and South Wales Area, in 1934. During the war Mr. Batty served with the Royal Engineers and held the rank of lieutenant-colonel on the 21st Army Group General Staff. In 1954 he was appointed senior assistant in the welfare and education and training section at divisional headquarters, Bristol.

**Viscount Falmouth** has been re-elected president of the British Internal Combustion Engine Research Association. **Mr. V. H. F. Hopkins** has been elected as chairman of Council and **Mr. J. G. Dawson** as vice-chairman.

Pelapone Engines, Ltd., a member of the Steel group of companies, announces the appointment of **Mr. R. W. Storey,** F.R.S.A., Associate I.E.E., as managing director in succession to **Mr. W. Speight,** who is retiring after twelve years as managing director. In the early part of his career Mr. Storey was an electrical engineer with New Consolidated Goldfield in British West Africa and during the war years was a member of the Station Design and Installation Division of the British Broadcasting Corporation. He held positions with Crompton Parkinson, Ltd., the Brush Electrical Engineering Co., Ltd., and Simmonds Aerocessories, Ltd.

*Mr. R. W. Storey*

**Mr. R. Cook,** B.A.(Admin.), A.S.A.A., A.I.M.T.A., has been appointed chief accountant of the Midlands Electricity Board in succession to the late Mr. Fred Nock.

Mr. Cook was educated at Manchester University and began his career in 1934 with Manchester Corporation as a clerk and junior accountancy assistant. During the war he served in the Royal Artillery and from August, 1945, to September, 1946, he was staff captain in the finance and accounts section of the British Military Authority in Tripolitania. In December, 1946, he joined the staff of West Bromwich Corporation, and in 1949 became chief internal auditor for York Corporation. He joined the Midlands Electricity Board in 1952 as a principal assistant in the Chief Accountant's Department and was appointed deputy chief accountant in 1957.

**Mr. J. B. Rogerson** has retired from the position of technical service manager of Hoover, Ltd., after thirty-three years' service with the company. **Mr. R. Forsyth,** until recently dealer manager of the company, becomes technical service manager. Mr. Rogerson's retirement was marked by a dinner at the Savoy Hotel, London, given in his honour by Mr. S. Roberts, managing director of Hoover, Ltd., and presentations were made on behalf of the company's directors and friends and colleagues in the company.

**Mr. A. G. J. Buckle,** M.Sc., Ph.D., A.R.I.C., has been appointed technical director of the Technicon Instruments Co., Ltd. He was previously chief chemist of the Helsby Division of British Insulated Callender's Cables, Ltd. Dr. Buckle is at present in New York and on his return will establish a laboratory service in London for Technicon Instruments.

**Mr. J. F. Noyes,** A.M.I.E.E., has taken up an appointment as group leader (radio) in the Domestic Equipment Division of the Plessey Co., Ltd. He was previously chief radio engineer of Cossor Radio & Television, Ltd., and, before that, was in charge of radio development with Ultra Electric, Ltd.

The Electric Resistance Furnace Co., Ltd., has appointed **Mr. H. J. Tucker,** its southern area sales manager for the past ten years, as service manager. Mr. Tucker, who joined the Efco organisation in 1935, will continue to operate from the company's head office in Queens Road, Weybridge, Surrey.

**Mr. C. A. McNeill,** C.G.I.A., M.Amer.I.E.E., has joined the technical sales staff of Efco at its Midlands area office in Birmingham.

**Mr. M. J. Parsons,** who has been for many years with Edwards High Vacuum, Ltd., has joined the sales organisation of Efco at its head office in Weybridge, Surrey.

The **ex-British Westinghouse Association** recently held its fortieth annual reunion, Mr. F. N. Woods presiding over a gathering of fifty. The usual toast to the memory of George Westinghouse was duly honoured and also a "silent toast" to those who had passed on during the last year. A toast to the chairman was proposed by Mr. S. A. Spaul. Messrs. H. S. Aspinall and L. S. Richardson (still serving) and W. E. Warrilow, three members of the original Committee, were present. Messrs. M. Kaufmann and W. D. Taylor, respectively hon. secretary and hon. treasurer were thanked on completion of ten years' service in those capacities.

**Mr. E. N. Evans,** M.I.E.E., M.Amer.I.E.E., has been elected to the board of Blackstone & Co., Ltd., one of the Lister group of companies. Mr. Evans has been chairman of the I.E.E. Western Centre Supply Group and is at present serving on the Centre Committee. He will not be leaving the West Country as he will be attached to the organisation's head office at Dursley.

The new chairman of the Association of Supervising Electrical Engineers is **Mr. C. G. Aldridge,** of Bickley, Kent. Mr. Aldridge, who joined the Association in 1947, served his apprenticeship in electrical and mechanical engineering with the Westminster Engineering Co., Ltd., Willesden. Joining Hirst Electrical, Ltd., in 1949 as works manager, he became sales director of Hirst Electronic, Ltd., in 1951. He has travelled widely throughout Europe. Mr. Aldridge is a founder committee member of the Electrical Engineers (A.S.E.E.) Exhibition and past-chairman of the Association of Electrical Machinery Trades.

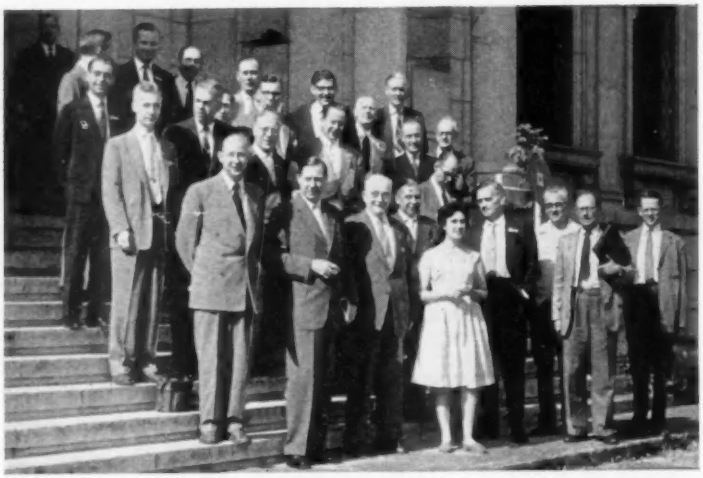
*Mr. C. G. Aldridge*

Brown Brothers, Ltd., have announced the following appointments:—**Mr. W. MacGregor** to be manager of Thomson & Brown Brothers, Ltd., Newcastle; **Mr. R. A. Sewell,** manager of the Glasgow branch of Thomson & Brown Brothers; **Mr. T. D. Dawson,** manager at Preston; and **Mr. H. L. Hodgson,** assistant manager in Belfast.

The Eastern Electricity Board has appointed **Mr. H. B. Rendle,** A.M.I.E.E., at present a senior assistant commercial engineer at its Suffolk Sub-Area headquarters, to be the manager of the Bury St. Edmunds District, in place of **Mr. F. A. Moinet,** who is now manager of the Hendon District.

*Mr. H. B. Rendle*

Mr. Rendle received his technical training at Faraday House and joined the staff of the engineering department of Edmundson's Electricity Corporation, Ltd., in 1928, being appointed personal assistant to Mr. A. Anderson, the manager of the eastern group of



*This group is the Electric Lamp Committee (No. 34) of the International Electrotechnical Commission whose meetings in Madrid are reported on page 63 of this issue. The British delegation included Messrs. S. Anderson, J. E. Greenhill, W. J. Jones, A. G. Penny, E. R. J. Randall, W. R. Stevens, Dr. J. W. Strange, Mr. J. Studholme, Dr. A. B. Whitworth, and Messrs. F. Widnall, J. F. Stanley and A. T. Vulliamy*

Edmundson's undertakings, in 1930. Mr. Rendle's association with East Anglia started in 1935 when he went to Stowmarket to join the East Anglian Electric Supply Co.

A Central Information Department of Associated Electrical Industries, Ltd., is being established in London under the joint management of **Mr. H. H. Lusty** and **Mr. R. H. Veysey,** who will be concerned respectively with advertising, and press and public relations. Mr. Veysey is assistant (public relations) to Lord Chandos, and Mr. Lusty is publicity manager of the Metropolitan-Vickers Electrical Co., Ltd., one of the A.E.I. companies.

**Mr. M. H. Ley,** A.M.I.E.E., has been appointed sales manager of Westool, Ltd., St. Helen's Auckland. He was until recently manager of the Rectifier Equipment Engineering Department of the Rectifier Division of Standard Telephones & Cables, Ltd.

*Mr. M. H. Ley*

Mr. Ley was educated at University College School, Hampstead, and the Northampton Polytechnic, London. He spent two years with Ferranti, Ltd., in their London sales office and joined Standard Telephones in 1939.

The **North East Electrical Club** held its annual golf field day recently at Ravensworth Golf Club, Co. Durham, and following the play Mr. T. M. Ayres, chairman of the North Eastern Electricity Board, presented the trophies and prizes. The winner of the Mullens trophy was Mr. P. Patterson, the runners-up being Mr. R. Dinning and Mr. H. Jameson. The winners of the foursomes were Messrs. J. Readdie and W. Rowell, and the winner of the putting was Mr. S. Mitchelson.

**Mr. P. E. Jackson** has been appointed regional technical sales engineer for the south-west of England for Erskine, Heap & Co., Ltd. He has been with Erskine, Heap & Co. since 1948. He will be operating from Bristol.

**Mr. H. F. Hudson,** M.I.E.E., who has been on the executive engineering staff at the Worcester Sub-Area headquarters of the Midlands Electricity Board since 1954, retired on 31st July. From vesting day until 1954 he was manager of the Worcester District. Mr. Hudson's address is "Barcroft," Onslow Drive, Ferring-on-Sea, Worthing, Sussex.

**Mr. A. E. Page,** general manager of the Osram Lamp Division of the General Electric Co., Ltd., has been elected chairman of the British Lighting Council in succession to **Mr. D. Bellamy,** D.L., C.B.E., chairman of the Yorkshire Electricity Board.

**Mr. F. G. Howard** has been appointed a director of the Hackbridge Cable Co., Ltd., and its subsidiaries, the Bryce Electric Construction Co. and Kelvin Non-Ferrous Metal Co.

**Mr. H. Brown,** M.I.T.A., has been appointed traffic manager of the Metropolitan-Vickers Electrical Co., Ltd.

**Mr. Forbes Jackson,** M.I.Mech.E., M.I.E.E., has been reappointed part-time member of the Southern Electricity Board.

**Mr. T. C. B. Miller,** M.B.E., M.I.Mech.E., M.I.Loco.E., motive power officer in the office of the Line Traffic Manager (Great Eastern), has been appointed to the new position of chief mechanical and electrical engineer, Eastern Region, British Railways, under a reorganisation scheme.

**Mr. W. J. Bird** has been appointed to the board of directors of Claude-General Neon Lights, Ltd., a subsidiary of the General Electric Co., Ltd. Mr. Bird is home sales director of the parent company.

**Mr. L. Bagrit** has been appointed chairman and chief executive of Elliott Brothers (London), Ltd., a subsidiary of Elliott-Automation, **Dr. L. L. Ross** managing director, **Mr. E. O. Herzfeld** deputy managing director and controller, and **Mr. G. C. Fairbanks** and **Comdr. H. Pasley-Tyler,** R.N. (Retd.), assistant managing directors. **Mr. L. C. Upsdell** is now a director and secretary of the company.

## OBITUARY

**Mr. Frederick Thomas Jackson,** O.B.E., Companion I.E.E., chairman and managing director of the Telephone Manufacturing Co., Ltd., and Telephone Rentals, Ltd., and founder of both companies, died on 14th August at the age of seventy-eight.

**Mr. Walter Charles Mountain,** Melton Mowbray, Leics., who was for forty-five years manager of the former Melton Electric Light Co., Ltd., until he retired in 1945, has died at the age of seventy-nine.

**Mr. J. Edwards.**—The death is announced, on 13th August, of Mr. John Edwards, of G. Hill & Co., Ltd., at the age of fifty-five. Mr. Edwards was chairman of the Manchester Branch of the Electrical Contractors' Association in 1957-58.

**Mr. Ernest Henry Derricott,** a founder member and director of Craig & Derricott, Ltd., Sutton Coldfield, died on 2nd August in his seventy-second year.

## Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

| | |
|---|---|
| ALUMINIUM ingots | ton £180 0s 0d |
| COPPER, H.C. Electro | ton £227 5s 0d |
| Fire Refined 99·70% | ton £226 0s 0d |
| Fire Refined 99·50% | ton £225 0s 0d |
| COPPER Tubes .. | lb 2s 3½d |
| Sheet .. .. | ton £265 5s 0d |
| H.C. wire and strip .. | ton £288 15s 0d |
| LEAD, English .. | ton £72 5s 0d |
| Foreign .. .. | ton £71 0s 0d |
| MERCURY .. .. | flask £72 0s 0d |
| TIN, block (English) .. | ton £792 10s 0d |
| ZINC, G.O.B. Foreign | ton £85 10s 0d |
| BRASS Tubes (solid drawn) .. .. | lb 1s 10½d |
| Wire .. .. .. | lb 2s 8½d |
| PHOSPHOR BRONZE Wire .. .. .. | lb 4s 1½d |
| PLATINUM .. .. | oz £28 10s 0d |
| RUBBER, No. 1 R.S.S. spot .. .. .. | lb 31½d—31¾d |

# Safety Interlocking

By W. H. THOMPSON, M.I.E.E.

## Types and Applications of Electrical and Mechanical Systems

**Maloperation of plant and danger to life and equipment must be prevented by reliable mechanisms which will always fail to safety. The author deals mainly with interlocks between apparatus and not with those which should be integral with the apparatus. Details are given of the more usual types of interlocks from which any desired protection scheme can be easily devised**

THE manipulation of some electrical and mechanical apparatus has become so complicated that to operate them continuously without mishap requires the incorporation of some form of safety interlock. The choice of the system will depend primarily on two things, the consequences of maloperation to plant and life and, secondly, the cost of the interlock against the cost of the damage that may occur.

The subject divides itself into two parts, first, the design of the interlock itself and, secondly, its application. While there are only a few designs of interlock items as such, there are innumerable ways of combining these to make as many interlock systems.

### Interlock Devices

Whatever form the interlock takes, there are a number of features which it must possess if it is to be effective and reliable. These are:—

(a) The action must be positive.
(b) The design should be simple.
(c) It must not involve undue delay to the operation it is to control.
(d) Maintenance should be easy.
(e) It should be difficult to defeat under normal conditions, but possible to be overridden in emergency.
(f) It should fail to safety.
(g) It should be economic.

**Bolt Interlock.**—The most simple form of mechanical interlock is the bolt, and the simplest application is that of two shafts of which the rotation of any one is dependent on the position of the other. The shafts A and B shown in Fig. 1 cannot be rotated at the same time and the rotation of either one is dependent on the position of the other, due to the intervention of the bolt. A similar interlock could apply to the axial movement of the shafts. This type of manual interlock is practically foolproof.

An electrically operated interlock for the same purpose is shown in Fig. 2. This generally requires a separate bolt and suitably shaped cam on each shaft. The bolts are controlled by gravity or springs and electric solenoids. The excitation of these solenoids is controlled by the position of the shafts. With shaft B locked in the position shown, solenoid A is excited and bolt A is raised so that shaft A may be rotated. Although this type of interlock is dependent on the supply of electricity, it would fail to safety if the supply failed and it could be overridden in an emergency by raising the bolts by hand.

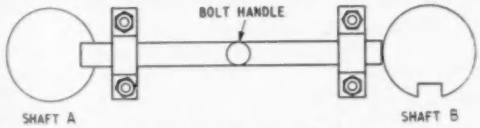



*Fig. 1.—Simple bolt interlock*

**Castell Interlock.**—Another form of mechanical interlock is the key type introduced by J. H. Castell in the early part of the century. Although there are now many forms of the Castell lock, it is the original figure lock that has made the scheme famous.

The lock comprises a brass body in which a shaft with a 1in square zinc-brass die-cast head rotates. The square shaft or shank protrudes through the rear of the body and the square head is embossed with letters or figures.

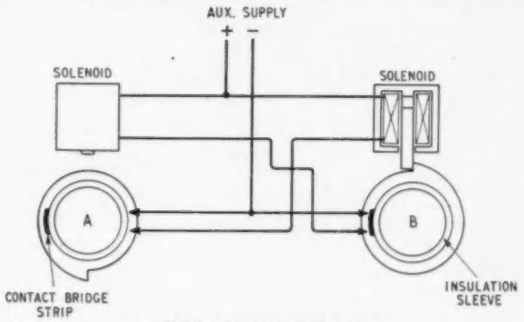



*Fig. 2.—Simple electrical interlock*

The key has corresponding letters or figures engraved in it to mate with the lock. To rotate the embossed block and shank, pressure must be applied to the key to overcome the small spring-loaded pawls within the body. A key with an engraving different from the lock would not press in far enough to release the pawls. The key can be made to trap itself in the block after either clockwise or anti-clockwise rotation. The system lends itself to the use of a "master" key that can cover a great number of lock changes.

A variety of fittings can be attached to the lock in the form of latches, catches, cams or a drum on which electrical contacts can be fitted. The type of fitting will depend on the particular application and a few examples are given below.

(1) A scheme with two locks controlling the rotation of a shaft is shown in Fig. 3. A special cam is fitted to the shanks of two locks A1 and B1. Only when the shaft is interlocked with the cam can the key be turned for withdrawal. When the key A1 is turned and removed the shaft is locked and the key may be used to enable

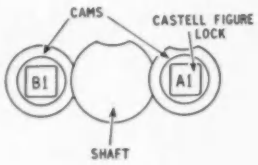



*Fig. 3.—Shaft rotation controlled by two Castell figure locks*

some associated device to be operated which is permissible with the shaft in that position. The same applies to lock B1 except that the shaft must be in a different position to enable key B1 to be removed.

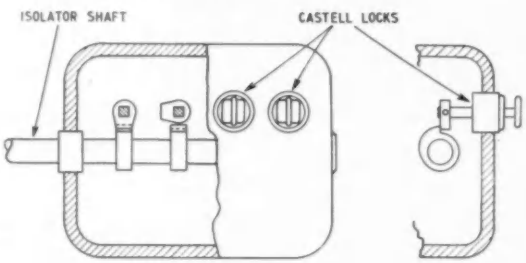
This type of interlock could be applied to a selector switch. The key A1 would normally be in another lock on a switch that controlled the power supply and only when that switch was open, could key A1 be obtained to insert in the lock A1 of the selector switch interlock. Turning this key would release the shaft, shown in Fig. 3, and the switch would then be turned into the "earth" position. The key A1 would then be trapped in its lock and key B1 released to be used to open a door for access to the plant. The lock in the door must, of course, be arranged so that the door must be closed and locked again before the key can be removed.

(2) A system using a series of locks to control the rotation of a shaft is shown in Fig. 4. A practical example is that of a high-voltage isolator used in a double-busbar transformer and switching station. The isolator shaft is taken into an operating box and fitted with four cams and locks. Each of the four locks is fitted with a latch and all keys must be obtained and the locks turned to release all these latches from the cams before the shaft can be rotated. Before these keys can be obtained the isolators and circuit-breaker in which they are normally kept must be in the "closed" position, except the earth switch, which must be in the "open" position. A by-pass isolator may now safely be operated since there is virtually no current passing through it until the circuit-breaker is opened. Any or all of the keys in the by-pass isolator operating box may now be turned, which will lock this isolator, and the keys can then be removed to operate the circuit-breaker or other isolators as required.

(3) An electrical drum interlock is shown in Fig. 5 and comprises an insulated drum mounted on the shank of the Castell lock. One or more spring-loaded contact fingers press on the drum to make contact when the copper bar bridges them. One of the many applications of this type of interlock is to interrupt the closing-coil circuit of a circuit-breaker. When the key is removed the circuit-breaker cannot be power operated.

**Kirk System.**—The application of the American Kirk system is much the same as that of the Castell system. The main difference between the two designs is that, in the Kirk system, a Yale type key is used as against the "figure" type key in the Castell design. In both systems, the key can be made to trap itself in the lock in one or the other position.

*Fig. 4.—Series of locks controlling an isolator*



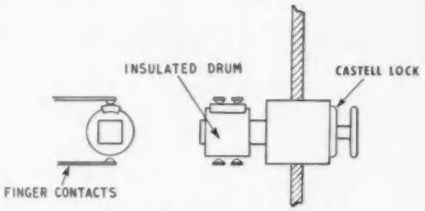




*Fig. 5.—Electrical drum interlock*

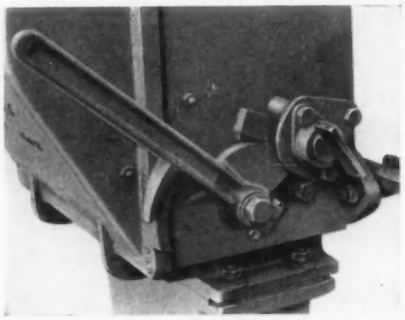


*Fig. 6.—English Electric fuse-switch fitted with figure interlock*

## Mechanical Interlock Systems

These are mainly concerned with a single item of apparatus such as a machine tool, a steam, air or water valve, a cubicle door or a switch-fuse, etc. An example of a key interlock applied to an electric switch-fuse is shown in Fig. 6, which is self-explanatory.

An example of a machine tool application is shown in Fig. 7. It will be seen that a Castell lock prevents the removal of the safety guard on a press tool until the supply is switched off. Furthermore, when the supply switch has been opened and the key removed, this switch is locked open and when the key has been used to unlock the guard, the key is trapped in the guard lock until the guard is closed again and locked.

## Electrical Interlock Systems

In these cases the shank of the lock is generally fitted with one or more contact bars on a drum as described above and shown in Fig. 5. An application of this is when a power-operated electrical device, such as an oil circuit-breaker, is to be interlocked with the door of the cubicle containing it, Fig. 8. One of the bars on the drum completes the circuit-breaker trip-coil circuit, while the other bar completes the circuit-breaker closing-coil circuit. The key can be removed only when the trip-coil circuit is made and can then be used to unlock the cubicle door. When the door is opened, a spring-loaded bolt engages with the lock, prevents it from being turned and so traps the key.

## General Application

Apart from the single or direct application of an interlock, a few examples of which have been given above, there is the co-ordinated interlocking system for application to more complicated plant. Such an interlocking system will most likely be a mixture of electrical and mechanical interlock items, and the best way to understand this is from a description of a typical system.

**H.V. Switching Stations.**—Perhaps the most extensive scheme of safety interlocking is that used in high-voltage switch and transformer stations. A simple example of this kind of station is shown diagrammatically in Fig. 9, which shows a double-busbar station with bus-section and bus-couplers.

As an aid to the understanding of these interlock schemes, it is common practice to allocate symbols to the different functions of the locks and keys, for example: △-Key removable in either fully open or fully closed position; ○-Key removable only in fully open position of device; □-Key removable only in fully closed position of device.

In the scheme shown in Fig. 9 it is presumed that off-load busbar selection is adopted. A bus-coupler is provided and it is important that the selectors S1 and S2 shall not be closed at the same time. A lock is fitted to S1 and S2 for which there is only one common key and reference letter (S). This key is trapped in whichever isolator is closed. In addition to the interlock between them the selector isolators must also be interlocked with the feeder circuit-breaker. In this case, the breaker can be fitted with a lock of the type shown in Fig. 8. This key (CB) can be used to unlock either of the selector isolators when the feeder breaker is open, by virtue of a second lock fitted to these isolators. The same key can also be used on a similar lock on the breaker isolators. These two isolators are fitted only when a by-pass isolator is connected.

The by-pass isolator is fitted with four locks of the type shown in Fig. 4. Three of the keys (B, BP, L) are removable in either the fully open or fully closed position of the isolator and the fourth key (SX) is removable only when the isolator is open. The purpose of this lock can be seen from the diagram.

The final interlock for this feeder is that between the line isolator and earth switch. The isolator is fitted with a separate lock for this purpose, the key being removable only when the isolator is open. A similar lock is fitted to the earth switch with the same key function.

Most of the interlocks in the scheme described above are pure mechanical types. The same degree of interlocking can be provided with electrical interlocks, provided all the pieces of apparatus are power operated. In the majority of cases, however, all the items of apparatus are not power operated. The busbar selector isolators

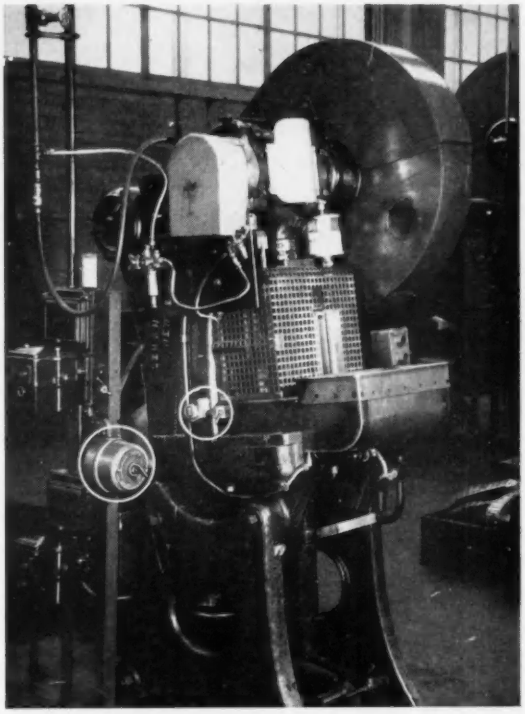


*Fig. 7.—A press with guard interlocked with the supply switch. The guard cannot be removed without first isolating the supply. (Photo. Gillette Industries, Ltd.)*

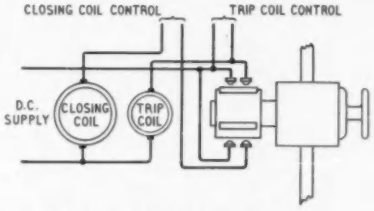



*Fig. 8.—Circuit-breaker door interlock*

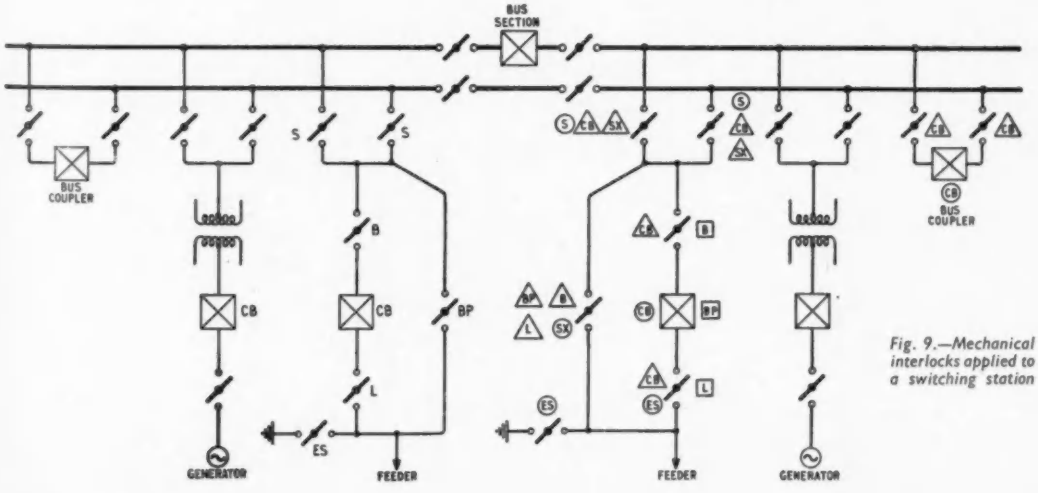
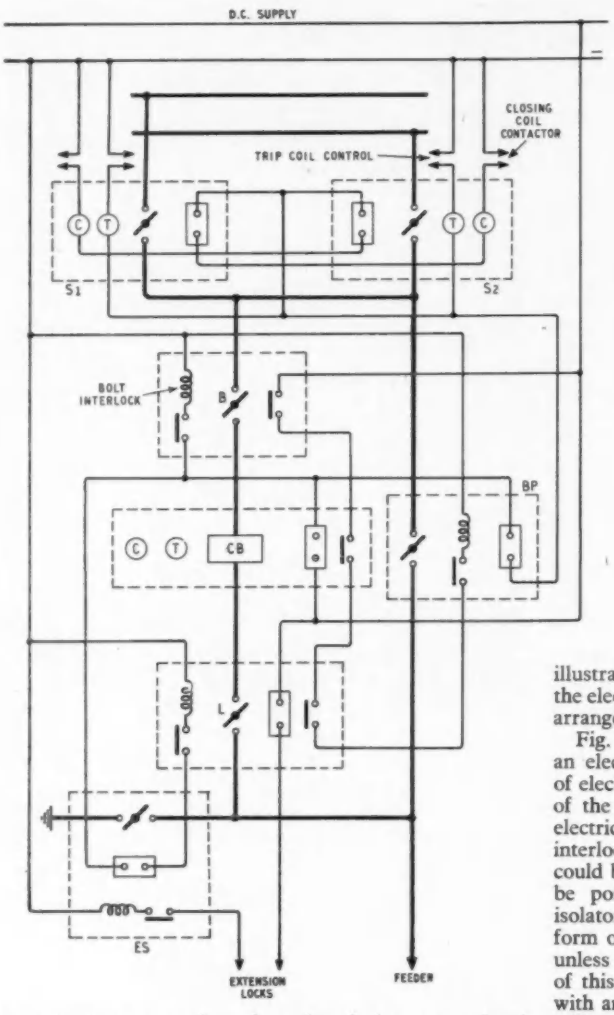



*Fig. 9.—Mechanical interlocks applied to a switching station*




may be but very often the other isolators are hand operated. In this case, the electrical/mechanical lock

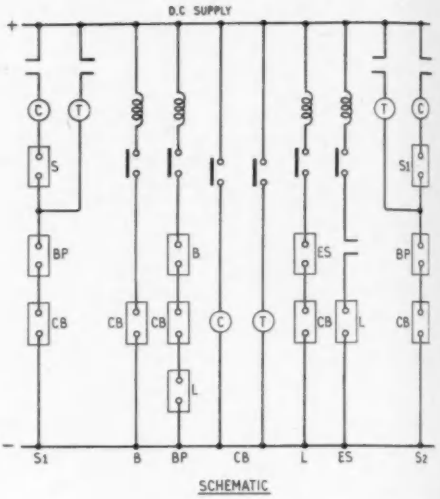



*Fig. 10.—Electrical interlocks applied to a switching station*

illustrated in Fig. 8 can be used and made to work in with the electrical interlock. This is, in fact, the most common arrangement.

Fig. 10 shows the connections for such a scheme. As an electrical interlock depends primarily on the supply of electrical energy, precaution must be taken that failure of the supply will not defeat the interlock. In an all-electric scheme, the failure of supply would cause the interlock to fail to safety because no piece of apparatus could be operated. But in a mixed scheme it would still be possible to attempt to operate the manual type isolators. It is therefore necessary to fit these with some form of interlock such that the item cannot be operated unless the electric supply is available. A common form of this type of interlock is to fit the piece of apparatus with an electric coil and plunger which, when energised, will cause the plunger to pull out a bolt and thus release the mechanism for hand operation.

# FIRE RESEARCH

IN the annual report of the Joint Fire Research Organisation of the Department of Scientific and Industrial Research and the Fire Offices' Committee (H.M. Stationery Office, 5s) details are given of the work that has been carried out into the causes of fires, method of extinction and casualties.

A special survey of fires of electrical origin during a period of one year (September, 1957-August, 1958) was undertaken to obtain information which might indicate methods of retarding the growth of the electrical fire hazard, which have been increasing uniformly with the rise in electricity consumption. The survey is not yet complete but there appears to have been a slight reduction in the rate of incidence of fires associated with the use of electrical equipment. The number of wire and cable fires has remained at a similar level to that in previous years but the number of fires in electrical apparatus was approximately one per 15 million kWh instead of the one per 10 million kWh expected. Whether this change is indicative of a decreasing trend or merely a chance fluctuation cannot yet be stated definitely.

A comparison of the figures for the fire hazard in domestic premises for a given quantity of heat energy obtained from various fuels used primarily for heating and cooking shows electricity to be nearly seven times and oil four times more prone to cause fires than coal or coke. It has been found that the number of fires caused by electricity is nearly proportional to the quantity of power supplied, and it appears probable that unless effective preventive measures are taken the annual incidence of fires in the home due to electricity may well increase by about 50 per cent in the next ten years to an annual figure of about 7,000.

A report from the director of the Safety in Mines Research Establishment in Buxton states that the investigation for the Central Electricity Generating Board into the venting necessary to prevent dangerous pressures from developing in a pulverised fuel mill has been continued. Plant is now under construction which will enable tests to take place in a mill in which a dust cloud will be ignited by a jet of flame simulating a blow-back from a furnace.

# INDUSTRIAL NEWS

## "Nuclear" Groups to Collaborate

Following negotiations which have been in progress for some weeks between the Nuclear Power Plant Co., Ltd., and the A.E.I.-John Thompson Nuclear Energy Co., Ltd., it has been decided that there shall be collaboration between the two companies in nuclear matters. The companies have informed the chairman of the Central Electricity Generating Board of this decision and negotiations are continuing with a view to settling details. It is the immediate intention of the companies to submit a joint tender for the projected Dungeness power station based on a common design and a similar procedure will in due course be followed for the station at Sizewell.

## Kenwood American Agreement

A deal has been concluded between the Kenwood Manufacturing Co., Ltd., England, and the Norge Division of Borg-Warner in Chicago, U.S.A. Borg-Warner are one of the largest American makers of all types of electrical equipment ranging from irons to control systems for rockets. The agreement with Norge means that Kenwood will extend their production in this country to a far wider range of electrical and catering appliances, including refrigerators and washing machines. Mr. K. Wood, managing director of the Kenwood Manufacturing Co., left London by air on 14th August for America where he will complete the final details of the deal. He was accompanied by the works director, Mr. C. Warner.

## English Companies and T.V.A.

*Reuter* reports that the English Electric Co. has submitted the only bids for two of a number of contracts to supply generators and turbines for the Tennessee Valley Authority's Wheeler Dam project. One of the bids was of $3,415,334 (about £1,219,300) and the other $5,025,315 (about £1,794,000). The English Electric was underbid by an American company on two other contracts and by an Austrian company on two more. The T.V.A. board has 60 days in which to study the bids before rejecting them or accepting them.

The Authority has awarded a contract for a 500 MW steam generator unit to the Brown-Boveri Co., of Switzerland. Unsuccessful tenderers were C. A. Parsons & Co. with a bid of about $11,500,000 (£4,006,000) and the English Electric Co. who quoted approximately $11,800,000 (£4,213,000).

## Caroline Haslett Memorial

Among its first awards the Caroline Haslett Memorial has granted scholarships to five candidates who will undertake domestic science training before embarking on a career in the electrical industry. The awards made in 1959, together with those given under the old Caroline Haslett Trust, bring the total to seventy-four. The Management Committee of the Memorial will shortly award a travelling exhibition to enable an electrical housecraft adviser to study some aspect of domestic electrification abroad.

The Caroline Haslett Memorial is offering a scholarship in engineering, mathematics or physical sciences at Cambridge University in 1960. The scholarship is open to young women who intend to make their career in the electrical industry. The scholarship will be of the value of £450 per annum for three years, and will be tenable at Girton, Newnham or New Hall. Application forms are obtainable from the secretary to the Management Committee, the Caroline Haslett Memorial (Electrical Section), 25, Foubert's Place, London, W.1.

## Trade Mark Case

In the High Court recently Simmonds & Stokes (Niphan), Ltd., obtained an order restraining Hobbies, Ltd., from infringing their trade mark "Niphan" (applied to the company's cable connectors). The judge awarded the plaintiffs the costs of the action and ordered an inquiry as to what damages had been sustained by them.

## Immersion Heater Campaign

A recent market survey of domestic electrical equipment showed that just over 23 per cent of domestic premises in Great Britain have electric water heaters installed. The figure for the London Electricity Board is something less than this, some of the reasons being that it has practically no rural areas where new electrical development is possible, and also that the gas industry is more firmly entrenched than in most of the other Electricity Board areas.

However, the London Board is determined to increase its electric immersion heater sales and has started on a campaign with that object in view. As a first step it has mounted on the roofs of some of its delivery and service vehicles a large scale model of an electric immersion heater which it is hoped will stimulate public interest in this type of water heater. Eighteen of these vehicles—one for each District of the Board—have been so fitted.

Advertisements are appearing in the local Press and film strips are being shown in local cinemas.

## London Retailers' New Showroom

Giles (Electrical Engineers), Ltd., has had two small electrical retail shops in Southampton Row, London, W.C.2, for some years, but with the growth of the business larger premises were required, and on Monday last week a new showroom was opened at 74, Southampton Row, opposite the older premises. Considerable reconstruction of the building has been necessary and it now has a large, attractively arranged display window. The showroom goes back in depth and customers entering first see the smaller electrical appliances, such as electric irons, on display, and these lead to the larger equipment, including electric washers, cookers, etc., while at the extreme end of the showroom a fully equipped electric kitchen has been laid out. The company now has twelve retail branches in the London and outer London area, and in addition has a number of branches in the provinces which are concerned with electrical contracting work.

## Railway Equipment Orders

An order for supervisory remote control equipment for the proposed electrification of the routes out of Liverpool Street to Enfield, Hertford East, Bishop's Stortford and Chingford, and from Fenchurch Street to Tilbury and Southend, has recently been placed with Standard Telephones & Cables, Ltd. The control stations will

*London Electricity Board vehicles showing large scale models of electric immersion heaters mounted on the roofs*

be at Romford for the Liverpool Street systems and at Pitsea for the Fenchurch Street systems. From these two control centres the complete 50 c/s power supply for the electrification scheme will be supervised.

Recent orders placed by British Railways include twelve diesel-electric locomotives of 1,550 h.p. for use in the Southern Region on the London-Hastings line, to be supplied by the Birmingham Railway Carriage & Wagon Co., Ltd. They will have Sulzer engines and Crompton Parkinson electrical equipment. The Fuller Electric Co. is to supply 134 booster transformers and Foster Transformers, Ltd., 150 booster transformers.

## Ferranti Producing Electricity Meters in Scotland

To meet the increased demand for electricity meters in Scotland, Ferranti, Ltd., announces that production of meters has recently commenced in its Dundee factory. Initially, production of the company's single-phase FMm and polyphase FMx meters is being undertaken, but it is anticipated that as the demand increases, other developments of the FM meter range will also be produced.

*Part of the new Meter Department of Ferranti, Ltd., at Dundee*

## Lighting in New Portsmouth Guildhall

An important part of the lighting system installed at the new Guildhall, Portsmouth, which was opened by the Queen on 8th June, has been supplied by the General Electric Co., Ltd. The main hall seats just over 2,000 people and has a cornice system of lighting supplemented by recessed spotlights. Twelve 70ft cornices of 0·040 "Perspex" moulded to a shallow radius and supported by cast brackets are mounted across the ceiling.

Each of the cornices accommodates a single line of "Osram" warm white cold cathode tubing, operated at 120 mA from transformers housed in the roof void. In addition, 96 "Gecoray" reflectors are mounted in specially designed soffit rings with louvres. The lamps housed in these reflectors are graded from 200 W nearest to the stage to 100 W above the gallery. Both types of source are controlled independently by dimmers, and in the "fully up" position illumination of 30 lumens per sq ft has been achieved at floor level.

The raised central portion of the Council Chamber ceiling is illuminated by 4ft 40 W warm white tubes housed in a "Perspex" cornice. Two continuous lines of architectural lamps concealed behind two main beams have been designed to illuminate the curtains and pelmet on the south side and name panels on the north side.

The two main entrance foyers are lighted by concealed 8ft 125 W tubes and on the column faces between the sills, "Striplite" lamps are mounted behind sand-blasted panels.

Throughout the remainder of the Guildhall the G.E.C. has supplied more than 900 fittings of varying types. The electrical installation was carried out by Griersons, Ltd., London.

*G.E.C. cornice lighting in the concert hall of the new Portsmouth Guildhall*

## U.K.A.E.A. Health and Safety Organisation

A revised form of the Health and Safety Organisation has been introduced by the United Kingdom Atomic Energy Authority. The principle that all Authority staff are responsible via the normal management chain of command for the safety of operations under their control remains unchanged. Separate health and safety organisations in each group headquarters are, however, being eliminated and a new Authority Health and Safety Branch is being established as part of the headquarters organisation. Dr. A. S. McLean has been appointed director of Health and Safety. Under his direction the technical work of the new branch will be undertaken by two divisions, a safeguards division and a radiological protection division.

## Prestcold South Wales Branch

The Lord Mayor of Cardiff (Alderman Mrs. Helena Evans, J.P.) officially opened Prestcold House, the new headquarters of the South Wales branch of the Prestcold Division of the Pressed Steel Co., Ltd., on 14th August. Prestcold House is at the junction of City Road and Newport Road. It will serve both as a headquarters and as a showroom for domestic refrigerators and commercial refrigeration equipment.

## Electrical Housecraft Classes

Evening classes of practical electrical instruction, which include meter reading, plug wiring, fuse mending and a general discussion on the latest equipment on display in the demonstration room and test kitchen, will be held during the autumn and winter at the headquarters of the Electrical Association for Women, 25, Foubert's Place, London, W.1. Already two courses are fully booked up from a waiting list from last year, but there are still four courses open in October and November. They are:—8th, 15th, 22nd and 29th October and 5th and 12th November (Thursdays, two courses); 27th October, 3rd and 10th November (Tuesdays, one course); and 28th October, 4th and 11th November (Wednesdays, one course). The cost of each 3-lesson course is 5s. Inquiries should be made to the E.A.W. Housecraft Department.

## Russian Shopping List

In the course of the recent negotiations in Moscow which resulted in the Five Year Trade Agreement, the Soviet delegation provided a list of machinery and equipment "for possible import" from the United Kingdom in the period 1960-64. The total value which the Russians place on the list is between £350 and £450 million at the official rate of exchange. (£1=11·2 roubles.)

This possible level of Russian purchases does not include the £276 to £300 million worth of industrial goods and raw materials which the Russians said they could buy during the same five-year period. Implementation of the programme will depend on the Soviet Union having sufficient foreign exchange and on the usual commercial considerations of price, delivery, etc. In supplying details of the list the Board of Trade points out that there

is no implication that export licences will be granted for goods which are subject to strategic embargo.

The Russian list includes: electrical equipment (80-100 million roubles); equipment for cable industry, including insulating machines, cable twisting and insulation coating machines, machines for production of coaxial electric cables (80-100 million roubles); equipment for production of electro-vacuum articles and transistor instruments (15 million roubles); radio-television, control and measuring instruments, telecommunication apparatus and instruments for automation of technological processes, including quantometers, electronic and high frequency radio measuring instruments (90-100 million roubles); refrigerating equipment, including deep freezing plants and conditioners for industrial use (90-100 million roubles).

## Price Reductions

Two further companies have announced reductions in the prices of fluorescent tubes. The A.E.I. Lamp & Lighting Co., Ltd., and Philips Electrical, Ltd., both announce that their 8ft 125 W fluorescent tubes have been reduced from 20s to 17s 6d, the reflector type in this rating from 22s to 20s and the miniature tubes from 11s 6d to 7s 6d (plus purchase tax 1s 4d).

## Southport Flower Show

Hyacinths in flower, together with the now traditional giant tomato plants, will be among the displays of this year's electricity stand at the Southport Flower Show. The exhibit, staged by the Merseyside and North Wales Electricity Board in co-operation with the North Western Electricity Board, illustrates the most important and profitable developments in the use of electricity at Lancashire nurseries, and is backed by results achieved by many leading growers.

## Transformers for Beirut

The Woden Transformer Co., Ltd., has recently completed shipment of a consignment of 3-phase power transformers to the American University at Beirut. The transformers are for use in the University power distribution scheme.

## American Turbo-Generator Prices

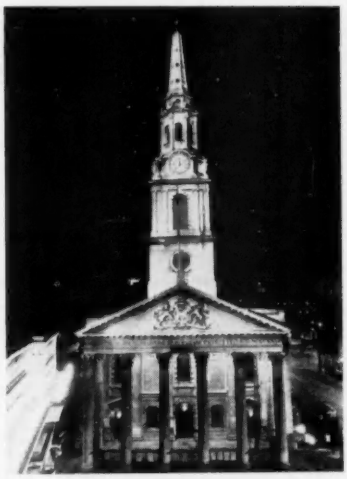
Recently the American General Electric Co. reduced its prices for large turbo-generators—by $1 per kilowatt for 200 MW sets up to $4 per kilowatt for 600 MW sets. Moreover the company decided not to take full advantage of price increases allowed under a price adjustment formula. It has since been announced that two other large American producers, Allis-Chalmers and Westinghouse, have followed the G.E.'s example.

## Electricity Council University Scholarships

The first successful candidates to be awarded scholarships in a scheme introduced by the electricity supply industry in England and Wales last autumn to help meet its growing need for highly trained scientists and engineers will be going to universities this autumn. Sixth formers intending to read for degrees in science and engineering were invited to apply for scholarships worth £450 a year at Oxford and Cambridge and £400 a year at other universities. About 350 applications were received and following interviews 45 scholarships were awarded, 19 of them by the Central Electricity Generating Board and 26 by the Area Boards. The scheme will be continued in the coming academic year and headmasters will be receiving particulars in September.

## St. Martin-in-the-Fields Floodlit

On 30th July the Mayor of Westminster switched on the floodlighting of St. Martin-in-the-Fields, Trafalgar Square, London. The floodlighting has been arranged by the London Publicity Committee of the British Travel and Holidays Association in co-operation with the vicar and parochial church council and Atlas Lighting, Ltd., which supplied the equipment for the installation. The main aim of the floodlighting is to emphasise the tower and spire as seen from Trafalgar Square. Strong high intensity lighting from the north-west is used, leaving the opposite side of the spire and tower in relative shadow. This strong directional light is provided by newly developed "Atlas" low voltage floodlights situated on the roof of the National Gallery. The supplementary lighting is by means of white fluorescent tubes, to light the south face of the church, and colour tubes are used in the portico and also inside the tower.



*Floodlighting of St. Martin-in-the-Fields*

## Electronic-Medical Equipment

Recently the Lord Provost of Edinburgh, Sir Ian A. Johnson-Gilbert, accompanied by members of the Town Council and officials, visited the Electronics Division of Bruce Peebles & Co., Ltd., and was shown two new items of electronic-medical equipment developed in the Division, a foetal heart detector and an ultrasonic device for treatment of patients suffering from complaints that deprive them of sense of balance. On the following day a party of doctors who had been attending meetings of the British and Canadian Medical Associations in Edinburgh visited the Division.

## Works to Close

Siemens Edison Swan, Ltd., an A.E.I. company, has decided to close down the Halifax factory of the subsidiary company, Alfred Graham & Co., Ltd., progressively during the next nine months. During the last five years Government orders have declined, and it has been necessary during the last year to reduce considerably the number of employees at Halifax. These measures have, however, not succeeded in rendering the company economic, in spite of the growth of lighting fittings equipment manufacture which now represents more than half of the total production. The manufactures at present carried on at Halifax will be transferred to other factories within the group which

*Part of the consignment of transformers supplied by the Woden Transformer Co., Ltd., to the American University at Beirut*

*Bowthorpe mobile showroom*

lend themselves more readily to economic production. The manufacture of lighting fittings, electrical distribution and railway signalling equipment will go to Spennymoor. Various miscellaneous forms of manufacture, including marine equipment, will be moved to factories at Woolwich and Tottenham.

Everything possible will be done to find employees alternative work. The Ministry of Labour will take all possible steps to achieve this before employees are due to finish with the company.

The A.E.I. security of employment provisions will apply. Employees with three years' service or more will receive extended periods of notice proportionate to their length of service.

### New Hoover Floodlighting

The existing sodium vapour floodlighting of the Hoover building on Western Avenue has been replaced by colour-corrected fluorescent lighting. The overhead lighting has been increased and the intensity has been stepped up fourfold. The natural colours are thus more clearly seen. Fluorescent lamps of 400 and 125 W, with a total power consumption of 20 kW, supplied by the A.E.I. Lamp & Lighting Co. are used for the lighting. The contractors for the installation were George Newman, Chingford, London, E.4. The display and exhibition department of Hoover, Ltd., advised on the lighting scheme.

### National Radio Show

The National Radio and Television Exhibition opens at Earls Court, London, on Wednesday next and will continue until Saturday, 5th September.

### Bowthorpe Mobile Showroom

A new mobile showroom constructed for Bowthorpe Holdings, Ltd., has commenced a tour of the country on behalf of the group's subsidiary companies. The showroom is so designed that its display panels may be interchanged from time to time in order to exhibit the different products of the various companies. The present display shows the products and the research and production facilities of the six divisions of Hellermann, Ltd.

### Plant for s.s. "Canberra"

The English Electric Co., Ltd., is supplying forty-eight transformers and the main a.c. distribution switchboard for the new 45,000-ton P. & O. liner, the *Canberra*, being built by Harland & Wolff, Ltd., at their Belfast shipyards. The transformers range from 20 kVA to 75 kVA. Because of the growing use of a.c. in ships, the English Electric Co. is holding training courses for customers' engineers in its Liverpool Switchgear Department. The courses, which generally last for a fortnight, cover the rudiments of a.c. theory, calculations of short-circuit currents, protection, and the construction, operation and maintenance of airbreak switchgear and combination fuse-switchgear. A 58-page publication, "A.C. Electrical Distribution for Ships' Auxiliaries," has recently been issued by the company.

### Hotpoint Contest Result

In its washing machine promotion contest among dealers for a 2·4 litre Jaguar car, with a fortnight's holiday for two for the six runners-up, A.E.I.-Hotpoint, Ltd., has announced that the first prize has been awarded to Mr. B. Page, of Page Domestic Appliances, Doncaster, who elected to take the cash alternative of £1,500. The presentation took place on 22nd July. Six runners-up received prizes.

### Wired Television Scheme

A new scheme is announced under which local television dealers will participate in providing a wired television system to relay B.B.C. and I.T.A. programmes.

Retailer participation will be through local subsidiaries of a national holding company, Multisignals, Ltd., which has been formed on the initiative of E. K. Cole, Ltd. (Ekco), and Thorn Electrical Industries, Ltd. (Ferguson). The scheme has been produced in co-operation with the Radio and Television Retailers' Association. In addition to television, the system will also relay the B.B.C.'s three programmes at present broadcast on v.h.f. wavebands. The directors of Multisignals, Ltd., are: Messrs. E. B. Willcocks, R. E. Davis, D. M. Keegan, M.P., and Lt.-Col. A. G. Johnson, M.B.E., E.D., and the registered office is at 105, Judd Street, London, W.C.1.

### Nucleonic Equipment for China

Orders for some £17,000 worth of nucleonic equipment were received from China by Ekco Electronics, Ltd., in July, following the recent removal of the embargo on sales of this type of equipment to "Iron Curtain" countries. The equipment ordered by China includes scintillation counters, scalers and ratemeters.

### Automatic Control for Australian Presses

Brookhirst Igranic, Ltd., a member of the Metal Industries Group, is to supply automatic control equipment valued at £8,500 for mechanical presses of up to 1,800 tons capacity, twelve of which will be built in England by Vickers-Armstrongs (Engineers), Ltd., for the new Volkswagon factory near Melbourne, Australia.

### Trade Announcements

Ekco Heating (**E. K. Cole, Ltd.**) announces the appointment of Mr. W. J. Bartrip as general sales representative for parts of London and its southern environs. His home address is "Woodcote," Yew Lane, Felbridge, East Grinstead, Sussex.

**D. J. Equipment (Hersham), Ltd.** 43, Queens Road, Hersham, Surrey (telephone: Walton-on-Thames 27672), has been appointed sole agent for England, Wales, Scotland and Northern Ireland for the range of lightweight portable spot welders and accessories manufactured by Louis Melzassard of Monte Carlo.

The Newcastle address of the **Lancashire Dynamo Group** is now Lancashire Dynamo Group Sales, Ltd., Eagle Star House, 32-34, Mosley Street, Newcastle-upon-Tyne, 1. The telephone numbers (Newcastle 28621 and 29736) are unchanged.

The head office staff, the Fittings Design and Illuminating Engineering Departments of **Atlas Lighting, Ltd.**, have moved to the new Thorn House, Upper St. Martins Lane, London, W.C.2 (telephone: Temple Bar 2444).

**G. P. Dennis, Ltd.**, and **Trunduct, Ltd.**, have opened a Glasgow office at 125, West Regent Street, Glasgow (telephone: Glasgow City 7414), under the management of Mr. E. M. Duke.

### Change of Address

The London office of Messrs. R. W. Gregory & Partners, consulting engineers, is now at 21, Bloomsbury Way, W.C.1 (telephone: Chancery 4273).

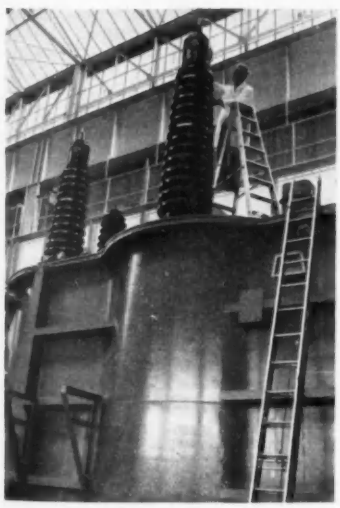
# GENERATION and DEVELOPMENT

### *Mersey Tunnel Lighting*

Work is proceeding on new lighting for the Mersey Tunnel and it is expected that the main tunnel and branch tunnels will be completely relit within about six months. Thirty prototype lighting units in the middle section of the tunnel constitute the opening phase of the new scheme. The new lighting, which has been evolved in the Liverpool city lighting engineer's experimental workshops, is in the final stages of testing. Each of the new lighting units consists of four 15 W fluorescent tubes. The lighting engineers, with technical aid from the lamp manufacturers, have solved the problem of installing the four tubes, with starter switches, chokes and condensers into a space intended originally to take one electric lamp.

### *Transformers for Northfleet*

The largest auto-transformer yet built by Fuller Electric, Ltd., a member of the Hawker Siddeley Group, the first of four 275/132 kV 120 MVA units, was dispatched to Northfleet, Kent, on 6th August. It will be installed at the new Central Electricity Generating Board supergrid substation and will be joined by the remaining three units within the next few months. Northfleet is on the southern side of the projected 275 kV overhead line crossing which traverses the Thames at this point. The new substation will be a focal point of the 275 kV supergrid connection to the existing 132 kV grid system in Kent. This is part of the integrated plan associated with the nuclear power station at Dungeness and projected cross-Channel connection to France.



*Preparing one of the four new 275/132 kV 120 MVA Fuller auto-transformers for test. The transformers will be installed at the new supergrid substation at Northfleet, Kent*

### *New Shropshire Substation*

Speaking at a luncheon after he had officially declared open a new 33 kV substation at Bishop's Castle, Shropshire, on 31st July, the chairman of the Midlands Electricity Board, Mr. W. S. Lewis, expressed the view that the electricity supply industry was capable of bearing the cost of rural development without Government aid.

He said that during the 40 years before the Board was established about 7,800 farms in its area had been connected while since then the number of farms on supply had been increased to 21,400, representing more than 80 per cent of the estimated total. They were now reaching the more sparsely populated districts in which it was costing as much as £350 to £400 to connect each consumer, but he said that in his view the industry was big enough to carry the rural development programme and that eventually they would get electricity even to the remotest places.

Mr. W. Winwood, manager of the Shropshire and Herefordshire Sub-Area, said they were the guests at luncheon of Mr. A. J. Nicholas, managing director of South Wales Switchgear, Ltd., whose company had supplied the switchgear for the new substation.

### *Jedburgh Reinforcement*

The South of Scotland Electricity Board proposes to augment the electricity supply to Jedburgh by providing two 33 kV circuits and by establishing a new 33 kV substation in the town. Modifications will also be carried out to the 33 kV circuits between Galashiels and Hawick in order to improve supplies to the latter town. The work is estimated to cost £110,100 and will be carried out over the next two years.

### *Motherwell Houses to be All-Electric*

Municipal houses of three storeys or more to be built in Motherwell and Wishaw in future will be all-electric. The Town Council is now to consider its policy as regards blocks of one and two storeys, and the director of housing will submit a report. The Housing Committee is to meet representatives of the South of Scotland Electricity Board soon to discuss details.

### *Supply to Farms*

The Eastern Electricity Board has recently connected the 25,000th farm to its network and Mr. John Hare, M.P., recently accepted an invitation to visit the 25,000th farmer at Red House Farm, Frostenden, near Wangford. The Minister, in congratulating the Board on its achievement, said that in the last eleven years it had raised the figure of farms connected from 10,000 to 25,000 at a capital cost of over £8 million.

### *Domestic Appliance Sales*

The accompanying table shows the number of new appliances sold by Area Electricity Boards in England and Wales for the month of June and for the twelve months ended 30th June last, together with the percentage change over corresponding periods of the previous year. When assessing the figures it must be borne in mind that the sales by Area Boards represent only a part of total sales throughout the country.

| | Month ended 30th June | | Twelve months ended 30th June | |
|---|---|---|---|---|
| | Total | % change | Total | % change |
| Cookers | 29,352 | +53·9 | 314,381 | +37·6 |
| Water Heaters: | | | | |
| Immersion | 30,694 | +35·8 | 180,043 | +16·8 |
| Storage | 6,082 | +46·2 | 56,145 | +29·2 |
| Wash Boilers | 5,755 | −12·5 | 74,818 | − 6·3 |
| Washing Machines | 13,607 | +100·6 | 148,638 | +100·4 |
| Refrigerators | 26,302 | +153·8 | 127,142 | +110·1 |

### *Slaithwaite Primary Substation*

On 21st July the new 66/11 kV primary substation of the Yorkshire Electricity Board at Slaithwaite was opened by Councillor H. Walker, J.P., chairman of the Colne Valley Urban District Council.

### *Bristol Change-over Completed*

The change-over to a.c. of the remaining d.c. supplies in Bristol was completed recently, among the last to be converted being the printing plant of a daily newspaper.

### *Work Starts at Trawsfynydd*

Immediately after the official site-opening ceremony on 1st July, Crompton Parkinson engineers started installing temporary power supplies at Trawsfynydd, site of Britain's latest nuclear power station. The temporary supply cable used on the site is to be manufactured by Derby Cables, Ltd., a member company of the C.P. Group.

## OVERSEAS

### *Development in Melbourne*

The report of the Melbourne City Electric Supply Department for the year ended 30th September last records an increase of 8 per cent in electricity sales, the total being 339·3 million kWh. It is stated that the rapid advance in building development has necessitated the establishment of sub-

stations in many of the new buildings in the city, with additions to the distribution network. During the year a further 1,570 kW of space heating equipment was connected in commercial and industrial premises. Revenue averaged 2·903d per kWh sold.

Statistics of fuel costs for the 254·2 million kWh generated by the Department show that the average cost, at 0·911d, was slightly lower than in the previous year. Up to 1954 the main fuels used were coal, coke and breeze, and briquettes, but in recent years these have been superseded largely by oil; last year fuel oil consumption amounted to 85,364 tons (out of a total of 105,977 tons) and cost on an average £4 19s 9d per ton.

### *Transvaal Power Station*

The South African Electricity Supply Commission (Escom) is at present erecting the Union's largest power station near Carolina in the Eastern Transvaal. The cost of the station, when completed to its ultimate capacity of 1,000 MW, is estimated at £55 million. Water will be supplied from the Nooitgedacht dam on the Komati River through a pipeline 42 miles long and 28in in diameter.

### *New Zealand Hydro-Electric Investigations*

The proposed hydro - electric development on the upper Waikato appears feasible, says a progress report received by the New Zealand Minister of Works, Mr. Watt, from Sir Alexander Gibb & Partners, of London, the consulting engineers making an investigation into the project. The potential installed capacity of the scheme, which involves the diversion of the headwaters of the Wanganui River on the mountain slopes 1,100ft above Lake Taupo and then by a combination of tunnels and channels into Lake Rotoaira, is put at about 425 MW. Extensive investigations necessary to determine the probable long-term mean flows at various key points are still in progress.

A preliminary reconnaissance of the resources of the Wanganui River made by the Ministry of Works indicates that a single-stage development might be possible. The proposal envisages the construction of a dam about 540ft high at Parakino, some 18 miles upstream from Wanganui, and the diversion of the Mangawhero River into the Wanganui River, justifying an installation with a capacity of upwards of 700 MW. Alternatively, the head available could be utilised in a number of smaller stations.

Further information is available from the Ministry of Works on the progress of its investigations into the proposal to divert the upper reaches of the Wanganui River into Lake Rotoaira and thence via Lake Taupo to the lower Waikato River. This would make available about 550 million kWh a year from stations on the Waikato and later the same water would produce an additional 290 million kWh a year from the proposed Tokaanu station. It seems practicable to divert about 650 cusecs from the Mangawhero River into the Wanganui, and by so doing produce about 180 million kWh directly from a station proposed at Matahiwi, about 30 miles up river from Wanganui.

### *Aswan Dam Project*

It is reported in the Egyptian Press that President Nasser is to lay the foundation stone of the Aswan High Dam project on 28th December. Soviet plans for the first stage of the scheme are said to provide for a single open channel with six short tunnels instead of the originally proposed seven diversionary tunnels to carry the water round the dam while it is under construction. The length of the dam is to be reduced by more than 200 yd and the power station is to be sited on the west bank instead of the east. These and other modifications are expected to result in a saving of some £E6 million on the first phase of construction. This will take four years to complete.

### *Prototype Transmission System*

To enable transmission problems at 460 kV and 650 kV to be studied a prototype system over four miles long is being constructed near Pittsfield, Mass.

## I.E.E. PREMIUM AWARDS

The Council of the Institution of Electrical Engineers has awarded the following Premiums for papers read or accepted for publication during 1958.

### Group A

*Kelvin Premium* (*value* £25): P. N. Butcher, Ph.D. (Great Malvern).

*John Hopkinson Premium* (*value* £25): F. C. Winfield, M.Eng. (Newcastle-on-Tyne), T. W. Wilcox (Newcastle-on-Tyne) and G. Iyon, M.Sc. (Eng.) (Newcastle-on-Tyne).

### Group B

Electronics and Communications Section Premiums.—*Duddell Premium* (*value* £20): A. E. Karbowiak, Ph.D., B.Sc.(Eng.) (London). *Ambrose Fleming Premium* (*value* £15): G. D. Monteath, B.Sc. (Tadworth). Premiums (value £10 each): C. L. S. Gilford, M.Sc. (Wallington), J. E. Clegg, M.Sc. (Brighton, S. Australia), and T. G. Thorne, B.Sc. (Great Malvern); K. W. Cattermole, B.Sc. (Enfield); H. A. H. Boot, B.Sc., Ph.D. (Baldock), H. Foster (Baldock) and S. A. Self, B.Sc. (Baldock); D. E. L. Shorter, B.Sc.(Eng.) (Tadworth); L. C. Jesty, B.Sc. (Enfield); D. L. Richards, B.Sc.(Eng.) (Watford) and J. Swaffield, Ph.D., B.Sc.(Eng.) (Wembley); I. F. Macdiarmid (London) and B. Phillips, B.Sc.(Eng.) (London); J. A. Lane, M.Sc. (Ashford); R. G. Medhurst, B.Sc. (Wembley), Mrs. E. M. Hicks, B.Sc. (Wembley) and W. Grossett (Coventry); C. G. Mayo, M.A., B.Sc. (Purley) and H. Page, M.Sc. (Tadworth); and B. C. Angell (Wembley), J. B. L. Foot (Chorleywood), W. J. Lucas, M.Sc. (Wembley) and G. T. Thompson, B.Sc.(Eng.) (Wembley).

Measurement and Control Section Premiums. — *Silvanus Thompson Premium* (*value* £20): J. J. Hill, B.Sc. (Teddington). *Mather Premium* (*value* £15): G. H. Rayner, B.A. (Teddington). Premiums (value £10 each): E. W. Lee, B.Sc., Ph.D. (Nottingham); E. C. Rogers, B.Sc. (London); and Professor A. Tustin, M.Sc. (London), J. T. Allanson, M.Sc. (Birmingham), J. M. Layton, B.A., B.Sc. (Birmingham) and R. J. Jakeways, Ph.D. (Sheffield).

Supply Section Premiums. — *Sebastian de Ferranti Premium* (*value* £20): the late F. Busemann, Dr.Ing. (Epsom) and W. Casson (Brookmans Park). *John Snell Premium* (*value* £15): E. P. G. Thornton (Manchester) and D. H. Booth, B.Sc.(Eng.) (Altrincham). Premiums (value £10 each): G. A. Burns (Liverpool), F. Fletcher, M.B.E. (Coventry), C. H. Chambers (Barnet) and P. F. Gunning (London); and J. H. Walker, M.Sc., Ph.D. (Rugby) and N. Kerruish, M.A. (Rugby).

Utilisation Section Premiums.—*Crompton Premium* (*value* £20): P. McKearney, O.B.E. (London), L. S. Drake (Petts Wood) and E. G. Mallalieu, B.Sc. (London). *Swan Premium* (*value* £15): C. M. Cock (London). Premium (value £10): B. C. Robinson, M.Sc., Ph.D. (Newcastle-on-Tyne) and A. I. Winder (Newcastle-on-Tyne).

Non-Section Premiums.—Premium (value £10): P. Hammond, M.A. (Cambridge).

### Group C

*Blumlein-Browne-Willans Premium* (*value* £20): D. Gabor, Dr.Ing., F.R.S. (London), P. R. Stuart, Ph.D. (London) and P. G. Kalman (London).

*Heaviside Premium* (*value* £15): Z. Godzinski (Wroclaw, Poland).

Graduate and Student Premiums.—Premiums (value £10 each): H. E. Coles, B.Eng. (Wembley); G. K. Creighton, B.Sc.(Eng.) (Chatham) and W. M. Somerville (Dumfries); and D. Marshall (Leeds). Premiums (value £5 each): J. A. Chandler, B.Sc.(Eng.) (Rugby), J. A. Denham, B.Sc.(Eng.) (Newcastle-on-Tyne), A. P. Foster, B.Sc. (Wirral), J. J. Hunter (Glasgow), R. B. Larkinson, M.A. (Stafford), W. A. McCartney (Glasgow), and R. J. Meredith, B.Sc. (Leicester).

# NEW ELECTRICAL EQUIPMENT

## Transistorised Printers

Two types of high speed transistorised digital printers, each capable of producing a line of up to eleven characters at a maximum rate of five lines per second, have been introduced by VENNER ELECTRONICS, LTD., Kingston By-Pass, New Malden, Surrey.

The type TSA65 printer is intended for use with ten-line systems and the

*Venner digital printer*

type TSA66 printer is designed for use with single-line analogue input systems. Both models have dimensions of 16½in deep by 10in wide by 11½in high and operate from 230 V 50 c/s mains.

## Wire-Wound Resistor

A sub-miniature precision wire-wound resistor, claimed to be the smallest commercially available in Great Britain, is being produced by ALMA COMPONENTS, LTD., 551, Holloway Road, Holloway, London, N.19. Rated at 0·1 W, the resistance range available at present is from 10 Ω to 200 kΩ to a tolerance of ±0·1 per cent down to 100 Ω, below which it is ±1 per cent. The resistor is wound on a miniature ceramic bobbin in two sections to give minimum inductance. The lead spacing is 0·3in and is suitable for both the 0·1in and 0·15in printed circuit board grids.

## Pulse Monitoring Oscilloscope

A high frequency pulse monitoring oscilloscope with a rise-time of only two milli-microseconds, equivalent to a band width of d.c. to 220 Mc/s, has been introduced by MULLARD EQUIPMENT, LTD., Mullard House, Torrington Place, London, W.C.1. The instrument, type L.362, has been designed for the display or measurement of pulses of between 3 milli-microseconds' and 3 microseconds' duration and is suitable for nucleonic and computer research work. The sensitivity is 150 mV/cm, and thus, combined with the d.c. coupled amplifiers, the instrument is suitable for work on transistor circuits.

Extensive use is made of transistors and the instrument is portable and compact, weighing 27 lb and measuring 14½in by 8¾in by 18½in.

## Accelerometer

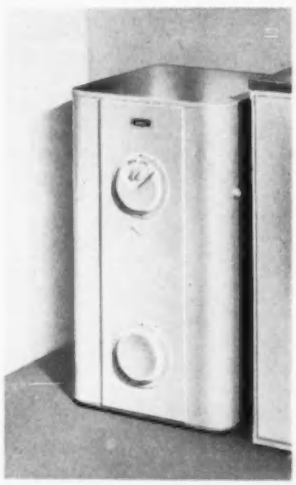
The lightweight high sensitivity type G88 transducer for measuring shock and vibration manufactured by TECHNICAL CERAMICS, LTD., Wood Burcote Way, Towcester, Northants., utilises a piezo-electric ceramic material having a temperature range from −40 to +80 deg C, low temperature coefficient and long-term stability. The transducer has a linear output over the acceleration range 0·01 to 250 g, and the transverse sensitivity is less than 5 per cent in any direction.

## Water Heater

The new "Double Top" 20 gal dual-purpose water heater, recently developed by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has two 3 kW elements—one at the top to heat approximately 5 gallons of water for daily household use and another at the bottom which is switched on when larger quantities of water are required.

A conveniently placed rotary switch selects either top or bottom element, but is so arranged that only one element can be on at a time thus enabling the heater to be operated from a 13 A socket outlet. Each element is thermostatically controlled.

The outer casing of the heater is



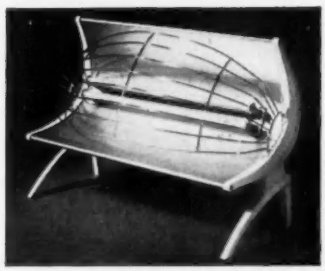
*G.E.C. "Double Top" 20 gal water heater*

made of sheet steel, finished in white stoved enamel, and the inner container of copper, lagged with regranulated cork. The inlet and outlet connections are ¾in B.S. pipe thread. The heater should be fed from a ball valve cistern tank, not more than 60ft above the heater. It measures 34in high by 19in square and will easily fit under a draining board. The price is £40 0s 8d including purchase tax.

## Electric Fires

The new "Superglo" portable electric fire developed by A.E.I.-HOTPOINT, LTD., 33, Grosvenor Place, London, S.W.1, is designed to reach its heating temperature very quickly and the shape of its reflector and the placing of elements is such that the heat is thrown well forward. Two sizes are available, 1 kW (6610) and 2 kW (6620), the rod-type elements being wound with 80/20 nickel chrome wire.

Modern in styling, it has a chromium plated parabolic brass reflector and there is a choice of six attractive



*Hotpoint 2 kW "Superglo" portable electric fire*

coloured finishes. To reduce discoloration with age and to allow free movement of warm air upwards, the top of the reflector is foreshortened, while the lower half is extended so that the floor temperature does not exceed that permitted by the relevant British Standard. End-cap connection of the elements is by a special welding which bonds the wire directly to the patented end-cap. As the contact blades are fully shrouded in ceramic pressings, they cannot "earth" inadvertently to the metal of the reflector. The wiring is enclosed yet easily accessible and a half-heat switch is provided on the 2 kW model.

The prices of the "Superglo" fire are £2 13s 3d (1 kW) and £3 11s (2 kW) plus 9s 9d and 13s respectively for purchase tax.

## Thermal Insulation for Floor Heating

"Onazote" is an edge insulant to prevent heat loss where the concrete raft containing electrical floor heating elements makes contact with the building's perimeter walls. The thickness and width of the slab required depends on local conditions, but an average installation employs 2in thick material to a width of 18 to 24in. Owing to its

low moisture absorption properties—1·5 per cent by volume after six weeks' total immersion—it possesses a constant thermal conductivity figure and also good mechanical properties, is resistant to chemicals and will not support fungoid or bacterial growth.

A pamphlet describing its use in this application is available from the manufacturers, EXPANDED PLASTICS, LTD., 675, Mitcham Road, Croydon, Surrey.

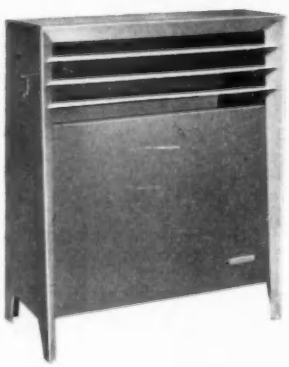
## Electric Heaters

Two new appliances, a fan heater and a convector, have been introduced by MORPHY-RICHARDS, LTD., 50, Conduit Street, London, W.1. The convector, named the "Sheerline," is claimed to be one of the lowest priced thermostatically controlled 2 kW convectors at present on the market. To meet the increasing demand for coloured appliances, the new model is presented in three colours—ember red, charcoal or blue. The dimensions are 20in high by 18in wide by 8in deep and the weight is 15 lb. It is available in two voltage ranges, 200/220 and 230/250 V, and the price is £6 5s, plus £1 2s 7d purchase tax in the United Kingdom.

The fan heater has a 2 kW element governed by a three-position switch—off, half-heat and full heat. A second three-position switch controls the speed of the fan—slow, medium and fast. A thermostat enables the temperature to be controlled at any chosen level. An automatic cut-out is also fitted.

The heater is finished in an attractive three-tone design, cinnamon and white with a red reflector. It is light and compact, weighing 10½ lb and measuring 17in high by 15in wide by 9in deep. Voltage ranges of 200/220 and 230/250 V are available. The price is £10 10s, plus £1 17s 11d purchase tax in the United Kingdom.

*Morphy-Richards 2 kW fan heater and 2 kW "Sheerline" convector*



## Millivoltmeter

The broadband-millivoltmeter made by N. V. PHILIPS GLOEILAMPENFABRIEKEN, Eindhoven, Holland, suitable for measurements in the acoustical and ultrasonic fields, on i.f. and a.f. amplifiers and on carrier telephone installations, is distributed in this country by Research & Control Instruments, Ltd., Instrument House, 207, King's Cross Road, London, W.C.1. The instrument has a frequency range from 2 c/s to 1 Mc/s, high sensitivity and input resistance and low input capacity, and is fully protected against overloads. Independent of mains voltage variations, it incorporates built-in calibrating voltages, and there is an additional switching position to overcome pointer vibrations at low frequencies. Good scale linearity is obtained as a result of a.c. negative feedback.

*Philips millivoltmeter*

## Power Transistors

Two power transistors intended for use in such heavy-duty industrial and military applications as power switching, voltage regulation and power supply circuits, and as relay-actuating devices, have been announced by RCA GREAT BRITAIN, LTD., Lincoln Way, Windmill Road, Sunbury-on-Thames, Middlesex. The type 2N561 is of the germanium p-n-p alloy type having a maximum peak collector current rating of 10 A and a maximum peak collector-to-base voltage of 80 V. The type 2N1014 is similar but has higher maximum peak collector-to-base and collector-to-emitter voltage ratings.

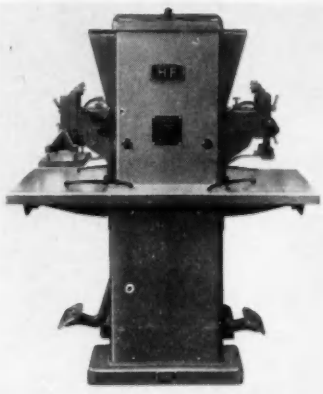
The design utilises a mounting structure in which the collector is electrically and thermally connected to a mounting flange. This arrangement provides good electrical contact and heat transfer from the transistor junctions to the heat sink.

## Portable Moulding Machine

In the portable injection moulding machine for such applications as cable jointing and sealing, and insulating components, announced by ASMIDAR PLASTIC MOULDING MACHINES, LTD., 10, Tachbrook Street, London, S.W.1, rotation of the crank handle injects up to 1¼ cu in of plastic material at a pressure of up to 2,500 p.s.i. The temperature control range extends up to 350 deg C, and the heater loading is 350 W. The equipment is suitable for connection to a 230 V a.c. or 24 V d.c. supply.

## Tandem Plastics Welder

A tandem head high frequency plastics welding machine incorporating the "Acme" No. 5 unit, a 2 kW equipment operating from a 200/250 V 50 c/s single-phase supply, and the "Acme" No. 6, a 3 kW machine operating from a 380/440 V 50 c/s three-phase four-wire supply, has been announced by H.F. INDUSTRIAL SERVICES, LTD., 317-319, High Road, Wood Green, London, N.22. Both operating heads work from one generator in a single console, economising in floor space. Each head functions independently and the presses are interlocked to prevent connection of the generator to both electrodes simultaneously. Both units incorporate such features as variable instantaneous electronic overload control, and an operation counter arranged to record only completed welds.

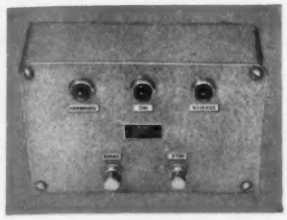


*H.F. Industrial Services tandem head welding machine*

Coincident with the introduction of this new machine, the Nos. 1 and 2 series, rated at 800 W, have been extended to include the No. 1 Mark 2, rated at 1½ kW, the No. 3, rated at 2 kW, and the No. 4, rated at 3 kW.

## Motor Control Unit

The control units type MCU introduced by the ELECTRICAL REMOTE CONTROL CO., LTD., Elremco Works, Harlow New Town, Essex, provide for automatic motor reversal, and are suitable for use where the periodic and alternate operation of two electrical circuits is involved. The period during which the circuit is closed, and the intervals between, are continuously



*ElRemCo control unit*

adjustable within a constant overall timing cycle which is specified by the customer and may be between 10 seconds and 30 days. The units, which have a switching capacity of 6 A at 250 V a.c. or 110 V d.c., have overall dimensions of 9in by 6in by 4½in, and can be supplied in watertight or flameproof enclosures.

### Cable Bands

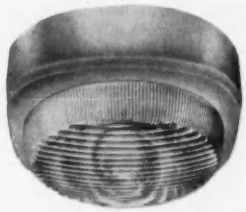
A range of polythene cable bands for bunching cables or wires in channelling, trunking or in harnesses, etc., has been introduced by AGRO ELECTRICAL CO., LTD., National House, 60-66, Wardour Street, London, W.1. They are available in three lengths, 2¾, 5½ and 6¾in, priced at 23, 24 and 26s per gross respectively.

### Isolator and Fuse

A number of new items were included in the range of air- and oil-break switchgear and associated apparatus manufactured by SWITCHGEAR & EQUIPMENT, LTD., Southam Road, Banbury, Oxon, which recently underwent a series of tests. The type AHV metalclad circuit-breaker is now certified at 250 MVA at both 6·6 and 11 kV, this applying to both the main o.c.b. and to the earthing device. A new single-break double rotating pedestal 275 kV air-break isolator was tested at 40 kA for three seconds, the test being carried out in accordance with B.S. 3078, and the new 11 kV repeater-type drop out expulsion fuse was tested at 100 MVA, while the non-repeater type d.o.e.f. was tested, to B.S. 2692, at 150 MVA at 11 kV.

### Bulkhead Lighting Fitting

A new compact bulkhead lighting fitting has recently been added to the range manufactured by HOLOPHANE, LTD., Elverton Street, London, S.W.1.



*Holophane No. 9785 bulkhead lighting fitting*

The fitting (catalogue No. F.9785) is for surface mounting and is designed for use with a 60 W lamp. Its robust construction makes it particularly suitable to withstand rough treatment and variable atmospheric conditions such as in exterior or interior lighting on balconies on municipal housing estates.

The body of the fitting is cast in silicon-aluminium alloy (weight 5 lb) and the prismatic glass is set in a substantial cover with concealed hinge, sealed against dust and moisture. It measures 8½in in diameter by 4in deep, the finish is in light grey, and provision is made for ¾in conduit entry.

## *Transistor Test Unit*

AN automatic test and data recording machine which considerably speeds up the testing of transistor devices and consequently minimises production test costs has been produced by Sylvania-Thorn Colour Television Laboratories, Ltd. Although primarily intended for the examination of junction diodes and transistors, the system can be applied to such other items of electronic equipment as condensers and resistors.

The machine can apply up to ten tests per device with a maximum resolution of ±2 per cent, at up to 1,000 devices per hour. The results are simultaneously recorded on punched tape and printed. The tests are applied sequentially, and the machine is able to compare readings with prescribed upper and lower limits for every test. The test sequence applied can be determined by the results of previous tests. To accommodate double testing procedures in which the devices are loaded or stressed environmentally between original and final inspection, provision has been made to correlate both sets of data so obtained and enable easier identification of the devices whose characteristics are unstable or changing. This is achieved on the page printer by interlacing the later results with the original and omitting the later results where they are identical to the previous test. In this way attention is drawn only to those units which have changed.

Basically the machine consists of a central control unit to which are added a number of plug-in test units which provide the a.c. and d.c. test conditions necessary to apply to a particular specification. One control unit can thus be made to cover a wide variety of diodes and transistors. The present ranges of current and voltage are 1 μA to 10 A and 100 mV to 1 kV. The equipment is fully transistorised and uses standard telegraph machinery for producing output data. All analogue quantities which are generated during the test procedure are digitised, first into a straight binary code for processing by the machine, and subsequently into the International Telegraph Code for output purposes. By converting immediately from analogue to digital form, all likely sources of error and drift are concentrated in one part of the machine and provision has been made for an automatic self-check to take place on each device tested. Other self-checking sequences are available for periodical and daily checks. A simplified version omitting some of the facilities can be supplied if required.

*The automatic tester, data recorder and data processor used in the production testing of germanium rectifiers*

# Mining Machinery Exhibition

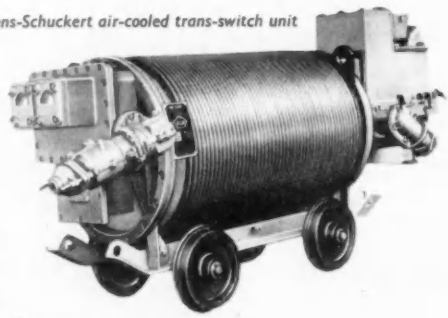
## ELECTRICAL EQUIPMENT MAKERS' CONTRIBUTION

THE 1959 exhibition of mining machinery and equipment sponsored by the Council of Underground Machinery Manufacturers was held at Olympia last month. Over 24,000 visitors, some 10 per cent of whom came from overseas, saw exhibits on more than 100 stands illustrating the developments in mining techniques that have taken place since the last exhibition was promoted by the Council in 1949.

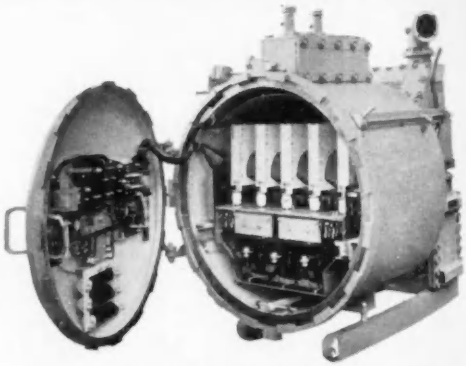
A large amount of electrical apparatus was shown at the exhibition, which was opened by the Minister of Power, Lord Mills. The Heavy Plant Division of Associated Electrical Industries, Ltd., showed a model of a tower mounted four-rope friction winder driven by two overhung d.c. motors totalling 3,400 h.p. and controlled by a closed loop system in conjunction with a Ward-Leonard motor/generator set. A flameproof high-voltage contactor was displayed by the British Thomson-Houston Co., Ltd., suitable for direct-on-line starting squirrel-cage induction motors up to 400 h.p. at 3·3 kV, three-phase, 50 c/s. The stator switch, reversing contactors and protective devices are contained in a single unit. The Metropolitan-Vickers Electrical Co., Ltd., exhibited a standard mining trans-switch unit comprising a mining type transformer fitted with a flameproof circuit-breaker on the h.v. side and an earth leakage current transformer at the l.v. neutral point. A contactor interior for converting old type MU81 gate end boxes to comply with the latest N.C.B. specification was among the flameproof control equipment on this stand. Also shown by this company was an underground electric locomotive in which the power for the two 46·5 h.p. 200 V series traction motors is obtained from a 100-cell 415 Ah lead acid battery.

Other electric locomotives were shown by Greenwood & Batley, Ltd., a 14 ton locomotive arranged for double-end control and a 5 ton single-end controlled model. A Bruce Peebles mining type battery charging rectifier was also exhibited on this stand. Laurence, Scott & Electromotors, Ltd., showed a range of flameproof motors and control gear, including a 100 h.p. water-cooled motor for the main drive of an N.C.B. shearer-loader, a 50 h.p. motor in which the drive is taken through the hollow main shaft to an hydraulic coupling mounted at the non-driving end, and a 50 h.p. motor with skin-type water cooling.

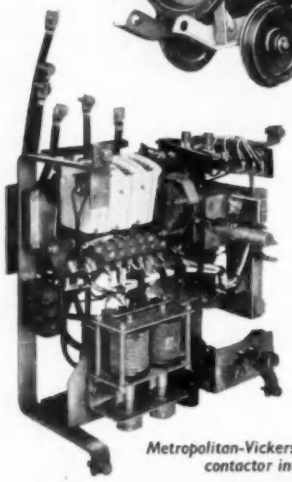
The Brush Electrical Engineering Co., Ltd., displayed a 300 kVA dry-type mining transformer, a 200 kVA, 3,300/565 V oil-filled trans-switch unit, switchgear exhibits including an 800 A metal-clad oil circuit-breaker for up to 11 kV systems and a number of motors from 12 to 400 h.p. Six medium-voltage air insulated gate end and other coal face units for the control of underground distribution and machine drives, including a



*Siemens-Schuckert air-cooled trans-switch unit*



*B.T.H. flameproof high-voltage contactor unit*



*Metropolitan-Vickers type MU8IC contactor interior*

*Victor Products coal saw*

200 A circuit-breaker, a 150 A contactor and a 4·5 kVA lighting transformer, were shown by A. Reyrolle & Co.

A flameproof 300 kVA air-cooled trans-switch unit fitted with an h.v. air-break isolator and a 400 A circuit-breaker on the l.v. side was exhibited by Siemens-Schuckert (Great Britain), Ltd. Other equipment on this stand included hand-held drilling machines, in one of which, the type E59, the outer casings are made from high-tensile brass or stainless steel to eliminate the spark hazard. An underground transformer fitted with a flameproof switch unit, examples of air-insulated and compound-filled switchgear, and power factor improvement capacitors were shown by Johnson & Phillips, Ltd., whose cable display included a drum of three-core p.i.l.c.d.w.a. 3·3 kV unearthed cable with p.v.c. over-sheathing.

Among the flameproof switch and control gear products of M & C Switchgear, Ltd., were a 3·3 kV direct-on-line starter rated at 230 h.p., and a 200 A air circuit-breaker for three-phase 50 c/s voltages from 400 to 650 V. Other items shown included a bell signalling transformer unit, pushbutton switches and a 50 A reversing air-break isolating switch. Drilling equipment operating from 50 or 150 c/s supplies was shown by Victor Products (Wallsend), Ltd., including a hand-held drill having external parts made from ferrous materials to prevent frictional sparking. Other products on view included a portable coal saw for use in steeply-inclined seams, gate end boxes and flameproof lighting equipment.

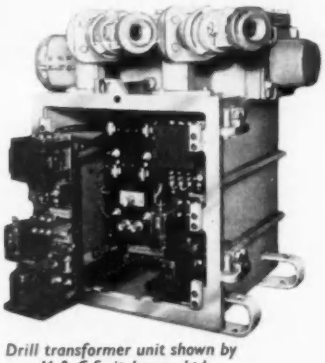
The type 58 automatic telephone exchange shown on the stand of A. T. & E. (Wigan), Ltd., and Communication Systems, Ltd., operates from a 24 V unearthed battery supply and combines automatic, magneto and priority calling, enabling automatic telephone services to be taken to the coal face.

Claimed to incorporate the most powerful single electric motor of any coal face machine in Great Britain, the Anderton shearer-loader shown with a range of coal cutting, conveying and crushing equipment on the British Jeffrey-Diamond, Ltd., stand embodies a 125 h.p. water-cooled motor of BJ-D design.

British Insulated Callender's Cables, Ltd., demonstrated repairs to trailing cables and exhibited a range of cables and accessories, and overhead equipment for underground haulage. Oldham & Son, Ltd., exhibited a shaft signalling unit, locomotive batteries, cap and hand lamps and emergency lighting units. Intrinsically-safe flameproof and industrial equipment shown by John Davis & Son (Derby), Ltd., included bells, signalling systems, junction boxes, electronic timers, transformers and a photo-electric relay for tub counting. The range of flameproof and industrial lighting fittings shown by Electricals, Ltd., included a new circular dustproof fluorescent and tungsten unit.

An electric drill mounted on a hydraulic leg and another having an integral water pump for wetting cuttings during drilling were exhibited on the stand of Hardypick, Ltd.

The main exhibits on the Wallacetown Engineering Co., Ltd., stand were a four-panel flameproof switchboard, a gate end box with overload and earth leakage protection and a 200 A flameproof circuit-breaker. In addition, there were industrial pattern multi-tier switchboards incorporating 30, 75 and 150 A contactors and 200 and 300 A circuit-breakers. A new gate end panel, available in 80 and 150 A capacities, was shown by Hugh Wood & Co., Ltd., together with a signalling system for use on a.c. circuits with either bare wire or concentric cable operating over distances up to approximately three miles.

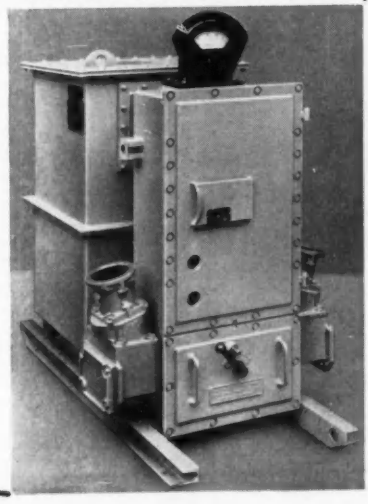


*Drill transformer unit shown by M & C Switchgear, Ltd.*

*An 80 h.p. British Jeffrey-Diamond coal cutter*

*Auto/magneto telephone exhibited by Communication Systems, Ltd.*

*Johnson & Phillips 60 kVAr 550 V capacitor*



*Left : Flameproof motor with hydraulic coupling by Laurence, Scott & Electromotors, Ltd.*

DOMESTIC ELECTRICAL EQUIPMENT

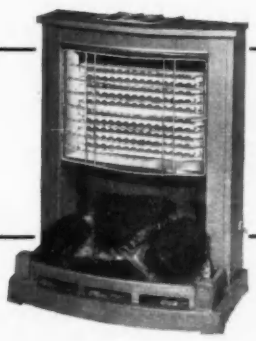
# ELECTRIC FIRES

THERE are almost 400 types of electric fires from which to make a choice, ranging from single-element bowl fires to the larger 2 and 3 kW models, with imitation coal or log effects. The portable reflector types are still most in demand although sales of imitation fuel models showed a marked increase last season. Domestic infra-red wall-mounted heaters which, with a nominal loading of 750 W, economically provide an excellent source of heat for the bathroom or kitchen, are growing in popularity. It is perhaps significant that with their introduction it is noticeable that several manufacturers have removed bowl fires from their current season's range.

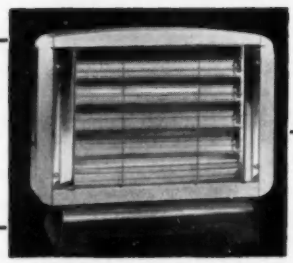
Apart from one or two manufacturers there has, since our last survey, been little change in the general design of electric fires, although certain models have been made more attractive by the use of colour. Typical of these are the Morphy-Richards "Cray" and "Avon" series, now produced in a choice of contemporary colours, while the new A.E.I.-Hotpoint "Superglo" parabolic reflector fire is available in six different coloured finishes.

| Manufacturer | Name or Model | Type | Total Loading | Elements | Finish | Price (excl. Tax) | Purchase Tax |
|---|---|---|---|---|---|---|---|
| A.E.I. HOTPOINT, LTD., 33, Grosvenor Place, London, S.W.1 | "Hystan" 5550/1/2 | Portable reflector | 2 kW | Two 1 kW rod | Cream, yellow and black, red and yellow | £5 1 0 | £0 18 6 |
| | "Parabain" 5321 | Wall mounting reflector | 1 kW | One 1 kW rod | Cream | £3 16 1 | £0 13 11 |
| | "Paraglow" 5380/1 and 5390/1 | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Cream or bronze | £2 8 7 (5380/1) £3 2 1 (5390/1) | £0 8 11 (5380/1) £0 11 5 (5390/1) |
| | "Jewel" 5510/1 | Portable reflector | 1 kW | One 1 kW rod | Cream or red | £2 2 3 | £0 7 9 |
| | "Parabeau" 5472 | Portable reflector | 2 kW | Two 1 kW rod | Gilt | £6 8 11 | £1 3 7 |
| | "Screen Heater" 5420 | Radiant heater | 1 kW | One 1 kW fused on glass | White and cream | £12 18 3 | £2 7 3 |
| | "Superglo" | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Choice of six colours | £2 13 3 (1 kW) £3 11 0 (2 kW) | £0 9 9 (1 kW) £0 13 0 (2 kW) |
| ARTIC FUSE & ELECTRICAL MFG. CO., LTD., Birtley, Co. Durham. | "Sunnyglow" | Portable, floodlit reflector | 1½ or 1¾ kW | One 1½ or 1¾ kW rod | Gold, silver, ivory, blue or green to order | £4 19 0 | £0 18 7 |
| | "Sunglade" | Portable, floodlit reflector | 2¼ or 3 kW | Two 1½ or 1¾ kW rod | Gold, silver, ivory, blue or green to order | £9 13 0 | £1 16 2 |
| BELLING & CO., LTD., Bridge Works, Southbury Road, Enfield, Middlesex. | "Hotspur" 141 and 142 | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Choice of three colours | £2 17 6 (141) £3 12 6 (142) | £0 10 7 (141) £0 13 4 (142) |
| | "Dinkie" 601 and 602 | Portable firebar | 1 or 2 kW | One or two 1 kW bar | Choice of two colours | £1 17 6 (601) £3 0 0 (602) | £0 6 11 (601) £0 11 0 (602) |
| | "Empire" 402E and 403E | Portable firebar | 2 or 3 kW | Two or three 1 kW bar | Beige | £4 0 0 (402E) £5 0 0 (403E) | £0 14 8 (402E) £0 18 4 (403E) |
| | "Solray" 151 and 152 | Portable or wall mounting | 1 or 2 kW | One or two 1 kW rod | Black and cream | £3 17 6 (151) £5 5 0 (152) | £0 14 3 (151) £0 19 3 (152) |
| | "Dainty" 226 | Portable firebar | 2 kW | Two 1 kW bar | Choice of three colours | £3 17 6 | £0 14 3 |
| | "Countess" 233 and 234 | Portable reflector | 2 or 3 kW | Two or three 1 kW rod | Choice of six colours | £5 17 6 (233) £6 15 0 (234) | £1 1 7 (233) £1 4 9 (234) |
| | "Modern" 228 | Portable reflector | 2 kW | Two 1 kW rod | Choice of three colours | £7 2 6 | £1 6 2 |
| | "Cheery" 360 | Imitation coal | 2 kW | Two 1 kW bar | Silver bronze or willow green | £8 2 6 | £1 9 10 |
| | "Homeguard" 155 | Portable safety reflector | 2 kW | Two 1 kW rod | Choice of two colours | £11 2 6 | £2 0 10 |
| | "Celtic" 753B | Period, log | 3 kW | Three 1 kW bar (concealed) | Antique (rustless) | £29 15 0 | £5 9 1 |

| Manufacturer | Name or Model | Type | Total Loading | Elements | Finish | Price (excl. Tax) | Purchase Tax |
|---|---|---|---|---|---|---|---|
| BELLING & CO., LTD., Bridge Works, Southbury Road, Enfield, Middlesex. *(continued)* | "Adam" 743B | Period, coal | 3 kW | Three 1 kW bar (concealed) | Armour bright (rustless) | £27 2 6 | £4 19 6 |
| | "Adam" 915 and 916 | Period, firebar | 2 or 3 kW | Two or three 1 kW bar | Armour bright (rustless) | £12 7 6 (915) £14 10 0 (916) | £2 5 5 (915) £2 13 2 (916) |
| | "Princess" 212 and 213 | Imitation coal | 2 or 3 kW | Two or three 1 kW rod | Choice of two colours | £10 10 0 (212) £11 10 0 (213) | £1 18 6 (212) £2 2 2 (213) |
| | "Princess" 212A and 213A | Imitation log | 2 or 3 kW | Two or three 1 kW rod | Choice of two colours | £11 0 0 (212A) £12 0 0 (213A) | £2 0 4 (212A) £2 4 0 (213A) |
| | "Medieval" 640 and 640A | Imitation coal (640) or log (640A) | 3 kW | Three 1 kW bar | Antique (rustless) | £15 10 0 (640) £17 7 6 (640A) | £2 16 10 (640) £3 3 9 (640A) |
| | "Medieval" 639 and 639A | Imitation coal (639) or log (639A) | 2 kW | Two 1 kW bar | Antique (rustless) | £13 12 6 (639) £15 7 6 (639A) | £2 10 0 (639) £2 16 5 (639A) |
| | "Waverley" 264 and 264P | Imitation coal, reflector | 3 kW | Three 1 kW rod | Choice of three colours | £18 17 6 (264) £22 16 0 (264P) | £3 9 3 (264) £4 3 8 (264P) |
| | "Melrose" 274 | Illuminated, reflector | 3 kW | Three 1 kW bar or rod | Choice of two colours | £16 17 6 | £3 1 11 |
| | "Converta" 178 and 179 | Fireplace screen, firebar (178) or reflector (179) | 2 kW | Two 1 kW bar or rod | Ripple bronze | £7 17 6 (178) £8 7 6 (179) | £1 8 11 (178) £1 10 9 (179) |
| | "Hearth" 159 and 159A | Imitation coal (159) or log (159A) | 2 kW | Two 1 kW bar | Bright (rustless) or bronze | £8 10 0 (159) £10 7 6 (159A) | £1 11 2 (159) £1 18 1 (159A) |
| | C/1/131 and C/2/132 | Panel, bronze inset | 1 or 2 kW | One or two 1 kW bar | Choice of six colours (panels) | £3 8 0 (C/1/131) £4 15 0 (C/2/132) | £0 12 6 (C/1/131) £0 17 5 (C/2/132) |
| | C/1A/131 and C/2A/132 | Panel, chromium inset | 1 or 2 kW | One or two 1 kW bar | Choice of six colours (panels) | £4 5 0 (C/1A/131) £5 13 0 (C/2A/132) | £0 15 7 (C/1A/131) £1 0 9 (C/2A/132) |
| BERRY'S ELECTRIC MAGICOAL, LTD., Touchbutton House, Newman Street, London, W.1. | "Adjustaberry" 457 | Imitation fuel | 2½ kW | Two 1¼ kW bar | Armour bright | £12 10 8 | £2 5 10 |
| | "Alderberry" 110 | Imitation fuel | 2 kW | Two 1 kW rod | Armour bright | £20 13 5 | £3 15 7 |
| | "Berrylog" A.2i/O | Imitation fuel | 1½ kW | Two ¾ kW bar | Satin antique | £10 12 8 | £1 18 10 |
| | "Berrylog" A.21/S | Imitation fuel | 1½ kW | Two ¾ kW bar | Satin antique | £9 18 8 | £1 16 4 |
| | "Emberberry" 108 | Imitation fuel | 2 kW | Two 1 kW bar | Armour bright | £16 10 7 | £3 0 5 |
| | "Emberberry" 109 (with dogs) | Imitation fuel | 2 kW | Two 1 kW bar | Armour bright | £19 14 10 | £3 12 2 |
| | "Masterberry" 444 | Imitation fuel | 2 kW | Four ½ kW rod | Warm silver | £15 17 11 | £2 18 1 |



1. *"Sunglade" portable fire (Artic Fuse)*
2. *Belling "Cheery" coal-effect fire*
3. *Berry's "Silhouette" radiant fire*



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| Manufacturer | Name or Model | Type | Total Loading | Elements | Finish | Price (excl. Tax) | Purchase Tax |
|---|---|---|---|---|---|---|---|
| BERRY'S ELECTRIC MAGICOAL, LTD., Touchbutton House, Newman Street, London, W.1. (continued) | " Mayberry " 441 | Imitation fuel | 2 kW | Two 1 kW rod | Warm silver | £13 3 9 | £2 8 3 |
| | " Woodberry " 406 | Imitation fuel | 3 kW | Two 1½ kW bar | Armour bright | £16 13 11 | £3 1 1 |
| | " Adam Shell " 8 | Imitation fuel | 3 kW | Two 1½ kW rod | Antique bright (rustless) | £44 18 4 | £8 15 2 |
| | " Fleur-de-Lis " 40 | Imitation fuel | 3 kW | Two 1½ kW rod | Armour bright | £37 8 1 | £7 5 11 |
| | " Georgian " 2 | Imitation fuel | 3 kW | Two 1½ kW rod | Antique bright (rustless) | £39 7 10 | £7 13 8 |
| | " Jacobean " 5 | Imitation fuel | 3 kW | Two 1½ kW rod | Armour bright | £30 18 5 | £6 0 7 |
| | " Queen Anne " Pedestal 11 | Imitation fuel | 3 kW | Two 1½ kW rod | Antique bright (rustless) | £49 8 3 | £9 12 9 |
| | " Regency " 20 | Imitation fuel | 2 kW | Two 1 kW rod | Antique bright (rustless) | £38 2 4 | £7 8 8 |
| | " Wilton " 42 | Imitation fuel | 3 kW | Two 1½ kW rod | Antique bright (rustless) | £71 0 1 | £13 16 11 |
| | " Berrylog " A.28 (Special 36in) | Imitation fuel | — | Log effect only | — | £12 15 8 | £2 9 10 |
| | " Berrylog " A.28 (Standard 24in) | Imitation fuel | — | Log effect only | — | £8 19 11 | £1 15 1 |
| | Curb Heater 457 | Radiator | 2½ kW | Two 1¼ kW bar | — | £7 13 2 | £1 9 10 |
| | Curb Heater 98D | Radiator | 2½ kW | Two 1¼ kW bar | — | £8 19 11 | £1 15 1 |
| | Curb Heater 98E/2 | Radiator | 2 kW | Two 1 kW bar | — | £9 15 5 | £1 18 1 |
| | Curb Heater 98E/2½ | Radiator | 2½ kW | Two 1¼ kW bar | — | £11 15 2 | £2 5 10 |
| | " Charmberry " 454 | Imitation fuel | 2 kW | Two 1 kW rod | Silver rose or warm silver | £10 19 5 | £2 0 1 |
| | " Charmberry " 550 | Imitation fuel | 3 kW | Three 1 kW rod | Silver rose or warm silver | £12 9 10 | £2 5 8 |
| | " Wellberry " 470 | Imitation fuel | 2 kW | Two 1 kW bar | Hammered finish | £9 19 11 | £1 16 7 |

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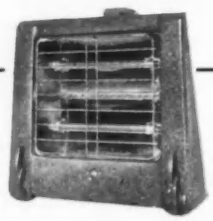

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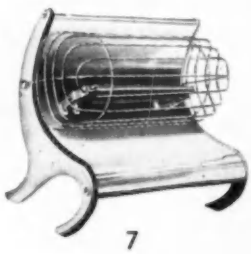

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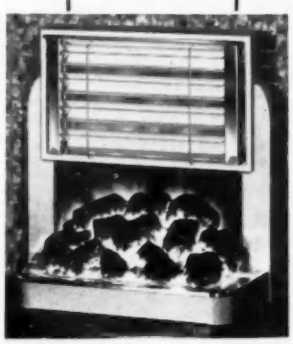

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4. *"Nichro" model 448 wall fire (Cranmer & Cheshire)*
5. *C.W.S. "Windsor" reflector fire*
6. *"Flamera" imitation coal fire (E. K. Cole)*
7. *Carron "Curtsey" reflector fire*
8. *Berry's "Auraberry" coal-effect fire*

| Manufacturer | Name or Model | Type | Total Loading | Elements | Finish | Price (excl. Tax) | Purchase Tax |
|---|---|---|---|---|---|---|---|
| BERRY'S ELECTRIC MAGICOAL, LTD., Touchbutton House, Newman Street, London, W.1. *(continued)* | "Auraberry" 447 | Imitation fuel | 2 kW | "Paravec" special | Silver rose or warm silver | £14 17 2 | £2 14 4 |
| | "Studio" 633 | Portable radiator | 2 kW | Two 1 kW rod | Silver rose with cherry legs and handle | £4 10 0 | £0 16 6 |
| | "Chameleon" 490 and 491 | Colour changing electric fireplace | 2½ kW | "Paravec" special | — | £27 15 3 | £5 8 3 |
| | "Silhouette" | Portable radiator | 2 or 3 kW | "Paravec" special | Silver rose with gunmetal base | £13 5 6 | £2 8 6 |
| CARRON COMPANY, Carron, Falkirk. | "Sirius" | Portable firebar | 1 or 2 kW | One or two 1 kW bar | Vitreous enamel | £2 2 6 (1 kW) £3 7 6 (2 kW) | £0 7 9 (1 kW) £0 12 4 (2 kW) |
| | "Curtsey" | Portable reflector | 1 or 2 kW | One or two 1 kW rod | "Carrontine" | £2 2 6 (1 kW) £3 1 6 (2 kW) | £0 7 9 (1 kW) £0 11 3 (2 kW) |
| | Pedestal | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Art silver | £2 19 0 (1 kW) £3 19 6 (2 kW) | £0 10 10 (1 kW) £0 14 7 (2 kW) |
| | "Sunglo" | Portable reflector | 2½ kW | Two 1¼ kW rod | Chromium | £8 12 0 | £1 11 5 |
| | "Precentor" | Portable reflector | 1 or 2 kW | Two 1 kW rod | "Carrontine," cream and gold | £3 16 0 (1 kW) £4 17 0 (2 kW) | £0 13 11 (1 kW) £0 17 9 (2 kW) |
| | "Firebird" | Portable firebar | 1 kW | One 1 kW spiral | "Carrontine," various finishes | £2 15 0 | £0 10 1 |
| E. K. COLE, LTD., 5, Vigo Street, London, W.1. | "Victor 10" PF1 | Portable reflector | 1 kW | One 1 kW rod | Cream enamel, chromium or copper reflector | £2 17 6 | £0 10 2 |
| | "Victor 20" PF2 | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Cream enamel, chromium or copper reflector | £3 13 0 | £0 13 3 |
| | "Victor 25" PF25 | Portable reflector | 1¼ or 2½ kW | One or two 1¼ kW rod | Cream enamel, chromium reflector | £5 5 0 | £0 19 0 |
| | "Minora 20" WF2 | Low level wall mounting reflector | 1 or 2 kW | One or two 1 kW rod | Bronze enamel, chromium or copper reflector | £4 16 3 | £0 17 5 |
| | "Flamera" DF2 | Reflector, imitation coal | 1 or 2 kW | One or two 1 kW rod | Bronze enamel with copper reflector or silver enamel with chromium reflector | £11 9 3 | £2 1 5 |
| | "Firestreak" FS75 | Wall mounting | 750 W | Infra-red spiral in silica tube | Chromium reflector, coloured end caps | £3 13 0 | £0 13 3 |
| CO-OPERATIVE WHOLESALE SOCIETY, LTD., National Works, Hall Street, Dudley. | "Windsor" | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Honeydew or copper lustre | £3 0 0 (1 kW) £5 4 3 (2 kW) | £0 11 0 (1 kW) £0 19 1 (2 kW) |
| | "Eden" | Portable firebar | 1 or 2 kW | One or two 1 kW bar | Grey or oyster green | £1 18 0 (1 kW) £2 18 0 (2 kW) | £0 7 0 (1 kW) £0 10 7 (2 kW) |
| | "Avon" | Portable firebar | 1 or 2 kW | One or two 1 kW bar | Grey or oyster green | £1 7 3 (1 kW) £2 4 3 (2 kW) | £0 5 0 (1 kW) £0 8 1 (2 kW) |
| | "Derwent" | Portable or wall mounting reflector | 1 kW | One 1 kW rod | Grey or oyster green | £1 14 2 | £0 6 3 |
| | Bowl | Portable reflector | 600 W | One 600 W spiral | Chromium, cast base | £1 16 3 | £0 6 8 |
| CRANMER & CHESHIRE, LTD., Steward Street, Spring Hill, Birmingham, 18. | "Nichro" 450 | Portable tilting reflector | 1 or 2 kW | One or two 1 kW rod | Silver grey or cream | £3 8 4 (1 kW) £4 4 6 (2 kW) | £0 12 6 (1 kW) £0 15 5 (2 kW) |
| | "Nichro" 424 | Portable double tilting reflector | 2 kW | Two 1 kW rod | Silver grey | £5 15 6 | £1 1 1 |

| Manufacturer | Name or Model | Type | Total Loading | Elements | Finish | Price (excl. Tax) | Purchase Tax |
|---|---|---|---|---|---|---|---|
| CRANMER & CHESHIRE, LTD., Steward Street, Spring Hill, Birmingham, 18. (continued) | "Nichro" 453 | Portable tilting reflector | ¾ or 1½ kW | One or two ¾ kW rod | Silver grey or cream | £3 2 6 (¾ kW) £3 15 6 (1½ kW) | £0 11 6 (¾ kW) £0 13 10 (1½ kW) |
| | "Nichro" 438 | Portable tilting reflector with glow lamp behind grille | 2 kW | Two 1 kW rod | Silver grey | £6 0 9 | £1 2 1 |
| | "Nichro" 451 | Wall fixing | 1 kW | One 1 kW rod | Cream enamelled or silver grey | £3 9 10 | £0 12 10 |
| | "Nichro" 452 | Wall fixing | ¾ kW | One ¾ kW rod | Cream enamelled or silver grey | £3 6 2 | £0 12 2 |
| | "Nichro" 448 | Wall fixing | ¾ or 1 kW | One ¾ or 1 kW rod | Cream and gold | £2 19 0 | £0 10 10 |
| | "Nichro" 454 | Portable, non-tilting reflector | 1 or 2 kW | One or two 1 kW rod | Silver grey or cream | £2 13 0 (1 kW) £3 9 0 (2 kW) | £0 9 8 (1 kW) £0 12 8 (2 kW) |
| DEXRAY ENGINEERING CO., LTD., 34, Ardwick Green South, Manchester, 13. | R.10 | Portable or inset | 2 kW | Two 1 kW rod | Cream or cream/gold | £6 5 0 | £1 3 5 |
| | R.15 | Wall mounting | 1 kW | One 1 kW rod | Cream and black | £3 10 0 | £0 13 2 |
| DIMPLEX, LTD., Millbrook, Southampton. | IRD.750/S | Wall mounting | 750 W | One 750 W infra-red spiral | Stove enamelled, various colours | £4 15 0 | £0 17 6 |
| | IRF.750 | Portable | 750 W | One 750 W infra-red spiral | Cream or bronze stoved enamel | £5 10 0 | £1 0 0 |
| | IRF.1500 | Portable | 1,500 W | Two 750 W infra-red spirals | Cream or bronze stoved enamel | £9 0 0 | £1 13 0 |
| ELECTROWAY HEATERS, LTD., Rosebery Street, Loughborough, Leics. | IR12 and VH2 | Inset, vertical reflector | 1 and 2 kW | One or two 1 kW rod | Chromium | £2 16 6 (IR12) £4 3 0 (VH2) | £0 10 4 (IR12) £0 15 3 (VH2) |
| | 2A2 | Inset, parabolic reflector | 2 kW | Two 1 kW rod | Chromium | £7 15 0 | £1 8 5 |
| | IHIR, IH2R and IH3R | Inset, horizontal reflector | 1, 2 and 3 kW | One, two and three 1 kW rod | Chromium | £3 8 6 (IHIR) £4 14 6 (IH2R) £7 13 6 (IH3R) | £0 12 7 (IHIR) £0 17 4 (IH2R) £1 8 2 (IH3R) |
| | IH1, IH2 and IH3 | Inset, panel bar | 1, 2 and 3 kW | One, two and three 1 kW bar | Chromium | £3 1 0 (IH1) £4 2 0 (IH2) £6 11 6 (IH3) | £0 11 2 (IH1) £0 15 0 (IH2) £1 4 0 (IH3) |
| | IE1R, IE2R and IE3R | Inset, horizontal reflector | 1, 2 and 3 kW | One, two and three 1 kW rod | Stoved enamel | £2 9 0 (IE1R) £3 11 6 (IE2R) £5 18 0 (IE3R) | £0 9 0 (IE1R) £0 13 1 (IE2R) £1 1 8 (IE3R) |
| | IG1R and IG2R | Wall, horizontal reflector | 1 and 2 kW | One or two 1 kW rod | Stoved enamel | £3 1 0 (IG1R) £4 6 0 (IG2R) | £0 11 2 (IG1R) £0 15 9 (IG2R) |
| | IG1 and IG2 | Wall, panel bar | 1 and 2 kW | One or two 1 kW bar | Stoved enamel | £2 16 0 (IG1) £3 11 0 (IG2) | £0 10 3 (IG1) £0 13 0 (IG2) |

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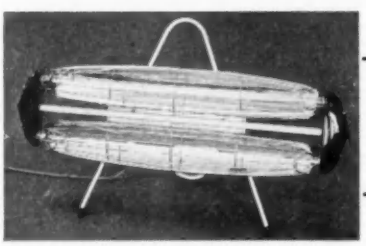

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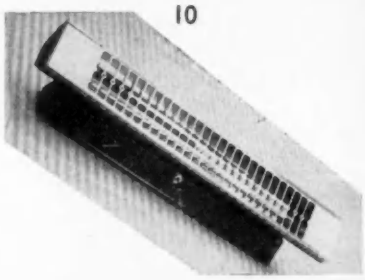
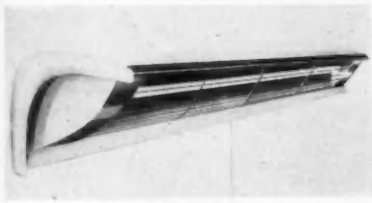


**9.** *Dimplex model IRF.1500 portable infra-red fire*
**10.** *Falk's "Supersil" wall mounting infra-red heater*

| Manufacturer | Name or Model | Type | Total Loading | Elements | Finish | Price (excl. Tax) | Purchase Tax |
|---|---|---|---|---|---|---|---|
| **ELECTROWAY HEATERS, LTD.,** Rosebery Street, Loughborough, Leics. *(continued)* | WIR12 and WVH2 | Wall, vertical reflector | 1 and 2 kW | One or two 1 kW rod | Chromium, stoved enamel plaque | £4 7 0 (WIR12) £5 13 6 (WVH2) | £0 16 0 (WIR12) £1 0 10 (WVH2) |
| | WH2 | Wall, panel bar | 2 kW | Two 1 kW bar | Chromium, stoved enamel plaque | £5 12 6 | £1 0 8 |
| | WH2R | Wall, horizontal reflector | 2 kW | Two 1 kW rod | Chromium, stoved enamel plaque | £6 6 0 | £1 3 1 |
| | WE2 | Wall, panel bar | 2 kW | Two 1 kW bar | Stoved enamel fire and plaque | £4 14 6 | £0 17 4 |
| | WE2R | Wall, horizontal reflector | 2 kW | Two 1 kW rod | Stoved enamel fire and plaque | £5 3 0 | £0 19 0 |
| | R12 | Wall, bathroom or portable | 1 kW | One 1 kW rod | Hammered silver stoved enamel | £3 1 0 | £0 11 2 |
| **ENGLEHARD INDUSTRIES, LTD.,** Hanovia Lamps Division, Bath Road, Slough, Bucks. | " Radisil " 58 | Wall mounting | 600 or 800 W | One 600 or 800 W infra-red spiral | Cream stove enamelled. Chromium reflector *(a)* Gold-plated reflector *(b)* | £4 10 0 *(a)* £5 15 0 *(b)* | £0 16 11 *(a)* £1 1 7 *(b)* |
| | " Radisil " 32 | Wall mounting | 1,600 W | One 1,600 W infra-red spiral | Cream stove enamelled. Chromium reflector *(a)* Gold-plated reflector *(b)* | £8 5 0 *(a)* £10 4 0 *(b)* | £1 11 0 *(a)* £1 18 3 *(b)* |
| **FALK, STADELMANN & CO., LTD.,** 91, Farringdon Road, London, E.C.1. | " Serenity " | Portable reflector, illuminated screen | 2 kW | Two 1 kW rod | Polychromatic gold | £10 8 6 | £1 18 2 |
| | " Felicity " | Portable reflector, illuminated screen | 2 kW | Two 1 kW rod | Polychromatic gold | £6 19 5 | £1 5 6 |
| | " Gaiety " | Portable reflector, illuminated | 2 kW | Two 1 kW rod | Gold | £5 10 0 | £1 0 1 |
| | " Festivity " U.95735 | Reflector, illuminated | 2 kW | Two 1 kW rod | Gold | £9 0 0 | £1 12 11 |
| | " Festivity " U.95736 | Wall mounting panel fire | 2 kW | Two 1 kW rod | Gold | £7 10 0 | £1 7 5 |
| | " Eclipse " | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Blue, red or cream | £1 14 9 (1 kW) £2 12 6 (2 kW) | £0 6 4 (1 kW) £0 9 7 (2 kW) |
| | " Comet " | Portable reflector | 750 W, 1 kW or 2 kW | One 750 W or one or two 1 kW rod | Off-white and black, cardinal red and black | £1 18 7 (750 W) £1 19 11 (1 kW) £2 19 0 (2 kW) | £0 7 1 (750 W) £0 7 4 (1 kW) £0 10 10 (2 kW) |
| | " Meteor " | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Off-white and black, cardinal red/cream, mocha/cream, gun-metal/cloud grey | £3 4 6 (1 kW) £3 18 9 (2 kW) | £0 11 10 (1 kW) £0 14 5 (2 kW) |
| | U.95756 " Supersil " | Wall mounting infra-red reflector | 750 W | One 750 W silica tube encased spiral | Cream or cardinal red, complete with double pole on/off cord switch | £4 10 0 | £0 16 6 |
| | U.95766 " Supersil " | Wall mounting infra-red reflector | 1,500 W | One 1,500 W silica tube encased spiral | Cream or cardinal red, complete with double pole on/off cord switch | £8 10 0 | £1 11 1 |
| | U.95765 " Supersil " | Portable infra-red reflector | 2¼ kW | Three 750 W silica tube encased spiral | Red/gold, black-gold, independently switched elements | £11 16 8 | £2 3 3 |
| **FALKIRK IRON CO., LTD.,** 28, Brook Street, London, W.1. | 39 | Portable reflector | 1 kW | One 1 kW rod | Stove enamelled, various colours | £2 4 6 | £0 8 2 |
| | 41 | Portable reflector | 2 kW | Two 1 kW rod | Stove enamelled, various colours | £3 2 6 | £0 11 5 |
| | " Firefly " 43 | Portable reflector | 1 kW | One 1 kW rod | Stove enamelled, various colours | £2 4 6 | £0 8 2 |

| Manufacturer | Name or Model | Type | Total Loading | Elements | Finish | Price (excl. Tax) | Purchase Tax |
|---|---|---|---|---|---|---|---|
| **FALKIRK IRON CO., LTD., 28, Brook Street, London, W.1.** *(continued)* | "Belford" | Inset, wall mounting | 1 or 2 kW | One or two 1 kW rod | Copper "Alisheen" front and sides, chromium reflector | £4 15 0 (1 kW) £5 5 0 (2 kW) | £0 17 4 (1 kW) £0 19 2 (2 kW) |
| | "Belford" | Semi-inset, wall mounting | 1 or 2 kW | One or two 1 kW rod | Copper "Alisheen" front and sides, chromium reflector | £5 9 0 (1 kW) £5 19 0 (2 kW) | £1 0 0 (1 kW) £1 1 9 (2 kW) |
| **FERRANTI, LTD., Hollinwood, Lancs.** | P.3310 | Panel reflector, ventilating grille | 2½ kW | Two 1¼ kW rod | Chromium reflector, frame. Decorative screen – £3 5s extra | £25 15 0 | £4 14 2 |
| | P.33132 | Panel reflector | 2 kW | Two 1 kW rod | Chromium reflector, frame and guard. Decorative screen £3 extra | £16 18 8 | £3 1 11 |
| | P.33122 | Panel reflector | 1½ kW | Two ¾ kW rod | Chromium reflector, frame and guard. Decorative screen £3 extra | £13 2 6 | £2 8 0 |
| **H. FROST & CO., LTD., Walsall.** | 261 | Portable reflector | 1 kW | One 1 kW rod | Stoved enamel | £2 8 4 | £0 8 9 |
| | 262 | Portable reflector | 2 kW | Two 1 kW rod | Stoved enamel | £3 4 2 | £0 11 7 |
| | 302 | Imitation coal effect | 2 kW | Two 1 kW rod | Stoved enamel | £10 7 6 | £1 17 6 |
| | 401 | Wall panel | 1 kW | One 1 kW rod | Stoved enamel | £2 12 0 | £0 9 5 |
| | 402 | Wall panel | 2 kW | Two 1 kW rod | Stoved enamel | £3 15 0 | £0 13 6 |
| | 403 | Wall panel | 1 kW | One 1 kW bar | Stoved enamel | £2 11 0 | £0 9 3 |
| | 404 | Wall panel | 2 kW | Two 1 kW bar | Stoved enamel | £3 9 0 | £0 12 6 |
| | 4020 | Wall panel | 2 kW | Two 1 kW rod | Stoved enamel | £5 15 0 | £1 0 9 |
| | 602 | Wall panel | 2 kW | Two 1 kW rod | Stoved enamel | £4 6 6 | £0 15 7 |
| | 7061 | Wall panel | 2 kW | Two 1 kW rod | Stoved enamel | £4 5 0 | £0 15 4 |
| | 312 | Wall panel, coal effect | 2 kW | Two 1 kW rod | Stoved enamel | £9 13 4 | £1 14 11 |
| | 177 | Inset | 1 kW | One 1 kW rod | Stoved enamel (*a*) or chromium (*b*) | £2 3 0 (*a*) £2 16 9 (*b*) | £0 7 9 (*a*) £0 10 3 (*b*) |
| | A.17 | Inset | 2 kW | Two 1 kW rod | Stoved enamel (*a*) or chromium (*b*) | £3 7 6 (*a*) £4 14 6 (*b*) | £0 12 2 (*a*) £0 17 0 (*b*) |
| | A.14 | Inset | 1 kW | One 1 kW bar | Stoved enamel | £2 4 0 | £0 7 11 |
| | A.24 | Inset | 2 kW | Two 1 kW bar | Stoved enamel | £3 2 6 | £0 11 3 |
| | 4021 | Inset | 2 kW | Two 1 kW rod | Stoved enamel | £4 16 7 | £0 17 5 |
| | 7021 | Inset | 2 kW | Two 1 kW rod | Stoved enamel (*a*) or chromium (*b*) | £7 2 10 (*a*) £10 12 10 (*b*) | £1 5 9 (*a*) £1 18 5 (*b*) |
| | 7031 | Inset | 3 kW | Three 1 kW rod | Stoved enamel (*a*) or chromium (*b*) | £7 11 9 (*a*) £11 1 9 (*b*) | £1 7 5 (*a*) £2 0 0 (*b*) |
| | 167 | Wall mounting | 750 W | One 750 W infra-red spiral | Stoved enamel | £4 15 3 | £0 17 3 |

| Manufacturer | Name or Model | Type | Total Loading | Elements | Finish | Price (excl. Tax) | Purchase Tax |
|---|---|---|---|---|---|---|---|
| GATEHILL MFG. CO., LTD., Kennard Road, Stratford, E.15. | " Sussex " | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Silver hammered or red | £1 3 0 (1 kW) £1 18 0 (2 kW) | £0 4 2 (1 kW) £0 6 10 (2 kW) |
| | " Stratford " | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Silver or gold | £1 6 6 (1 kW) £1 18 0 (2 kW) | £0 4 9 (1 kW) £0 6 10 (2 kW) |
| | " Richmond " | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Silver or gold | £1 9 5 (1 kW) £2 4 11 (2 kW) | £0 5 4 (1 kW) £0 8 1 (2 kW) |
| | " Phantail " | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Black | £1 12 0 (1 kW) £2 8 0 (2 kW) | £0 5 9 (1 kW) £0 8 8 (2 kW) |
| | 286 | Imitation coal effect | 2 kW | Two 1 kW rod | Gold | £5 10 0 | £0 19 10 |
| | " Becosil " 201 and 202 | Wall mounting | 725 W (201) 1,500 W (202) | One 725 W or 1,500 W infra-red spiral | White or red, aluminium guard | £4 10 0 (201) £8 10 0 (202) | £0 16 6 (201) £1 11 1 (202) |
| | " Becosil " 707 and 708 | Wall mounting | 800 W (707) 1,500 W (708) | One 800 W or 1,500 W infra-red spiral | White or red, gold plated guard | £4 10 0 (707) £8 10 0 (708) | £0 16 6 (707) £1 11 1 (708) |
| G.B.M. (ELECTRICAL) BIRMINGHAM, 439-443, Moseley Road, Birmingham, 12. | " Sunglow " | Wall mounting | 750 W (a), 1,000 W (b) or 1,500 W (c) | One infra-red spiral | Yellow, red, cream, gold or silver | £3 10 0 (a) £4 15 0 (b) £6 10 0 (c) | £0 11 4 (a) £0 15 5 (b) £1 1 1 (c) |
| GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. | D.2496G and D.2497G | Portable firebar | 1 or 2 kW | One or two 1 kW bar | Bronze, cream or green | £1 19 9 (D.2496G) £2 18 9 (D.2497G) | £0 7 3 (D.2496G) £0 10 9 (D.2497G) |
| | D.2758 | Pedestal bowl | 750 W | One 750 W spiral | Burgundy legs | £1 17 0 (Available September) | £0 6 9 |



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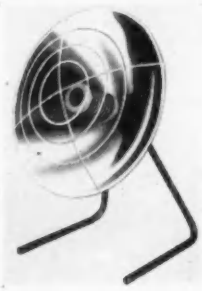

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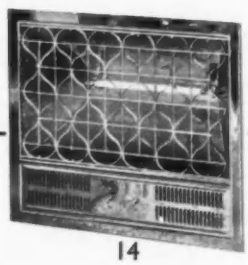

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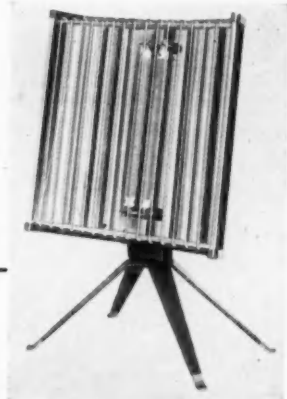
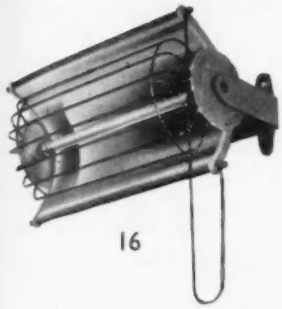


15

11. *"Becosil" infra-red heater (Gatehill Manufacturing Co.)*
12. *G.E.C. model D.2758 pedestal bowl fire*
13. *H. Frost "Sunhouse" coal-effect fire*
14. *Ferranti model P.3310 panel fire*
15. *G.E.C. model D.2818 "Cosyglo" fire*

| Manufacturer | Name or Model | Type | Total Loading | Elements | Finish | Price (excl. Tax) | Purchase Tax |
|---|---|---|---|---|---|---|---|
| **GENERAL ELECTRIC CO., LTD.,** Magnet House, Kingsway, London, W.C.2. *(continued)* | D.2775 | Portable reflector | 2 kW | Two 1 kW rod | Moonstone grey and burgundy with black legs | £5 1 3 | £0 18 6 |
| | " Cosyglo " D.2818 | Portable reflector | 2 kW | Two 1 kW rod | Burgundy and gold | £5 1 3 | £0 18 6 |
| | D.2776 and D.2777 | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Burgundy with black legs | £3 3 10 (D.2776) £4 4 1 (D.2777) | £0 11 8 (D.2776) £0 15 5 (D.2777) |
| **GRAFTON HEATER CO., LTD.,** 13-15, Westland Place, London, N.1. | 1056 | Portable reflector, coal effect | 750 W | One 750 W rod | Various colours | £2 16 0 | £0 10 6 |
| | 1060 | Bowl | 600 W | One 600 W E.S. | Various colours | £1 1 0 | £0 3 11 |
| | 1055 | Portable reflector | 750 W | One 750 W rod | Various colours | £1 3 6 | £0 4 5 |
| | 1055/2 | Portable reflector | 1½ kW | Two 750 W rod | Various colours | £1 19 6 | £0 7 5 |
| **GRIMWOOD (CROYDON), LTD.,** 59-65, Cross Road, Croydon. | " Infrasol " A.1 | Wall mounting | 750 W | One 750 W infra-red spiral | Stove enamelled and anodised | £4 0 0 | £0 14 5 |
| | " Infrasol " A.4 | Wall mounting, cord switch | 750 W | One 750 W infra-red spiral | Stove enamelled and anodised | £4 10 0 | £0 16 3 |
| **L. G. HAWKINS & CO., LTD.,** 30-35, Drury Lane, London, W.C.2. | " Boomerang " LGH.339 and LGH.340 | Portable reflector | 1 kW (339) 2 kW (340) | One or two 1 kW rod | Bronze, mushroom and cream | £2 19 0 (339) £3 12 11 (340) | £0 10 9 (339) £0 13 4 (340) |
| | " Three-way " LGH.336 | Portable reflector | 1 kW | One 1 kW rod | Bronze, mushroom and cream | £1 15 0 | £0 6 5 |
| | " Pixie " LGH.331 | Portable reflector | 1 kW | One 1 kW rod | Mushroom, silver or cream | £1 18 7 | £0 7 1 |
| | " Loughton " LGH.337 and LGH.338 | Pedestal reflector | 1 kW (337) 2 kW (338) | One or two 1 kW rod | Maroon and dove grey and all-cream | £2 19 0 (337) £3 12 11 (338) | £0 10 9 (337) £0 13 4 (338) |
| | " Two-way " maior | Portable reflector | 2 kW | Two 1 kW rod | Mushroom | £2 19 0 | £0 10 9 |
| **HEATRAE, LTD.,** Heatrae Works, Norwich. | " Saferod " | Reflector, wall mounting | 1 kW | One 1 kW embedded rod | Mushroom and chromium | £4 15 6 | £0 17 6 |
| | " Pilot " | Portable reflector | 1 kW | One 1 kW rod | Ivory tan | £4 9 6 | £0 16 5 |
| | " Dandy " | Portable reflector | 2 kW | Two 1 kW rod | Ivory tan | £8 2 0 | £1 9 8 |
| | " Majestic " | Reflector, floor mounting | 2 kW | Two 1 kW embedded rod | Cameo fawn and pebble grey | £12 12 0 | £2 6 1 |
| | " Ballerina " | Reflector, floor mounting | 2 kW | Two 1 kW embedded rod | Cameo fawn and pebble grey | £12 12 0 | £2 6 1 |
| **MARSDEN & BATESON, LTD.,** 67-69, Scholefield Street, Nechells, Birmingham, 7. | " Marbat " 1 and 2 | Inset firebar | 1 or 2 kW | One or two 1 kW bar | Hammered bronze or silver | £2 2 0 (1) £3 6 8 (2) | £0 7 8 (1) £0 12 2 (2) |
| | " Marbat " 3 and 4 | Wall panel, firebar | 1 or 2 kW | One or two 1 kW bar | Hammered bronze or silver | £2 13 9 (3) £4 0 10 (4) | £0 9 10 (3) £0 14 9 (4) |
| | " Marbat " bowl | Portable or wall mounting | 600 W | One 600 W spiral | Copper (*a*) or aluminium (*b*) | £2 5 0 (*a*) £1 18 6 (*b*) | £0 8 3 (*a*) £0 7 0 (*b*) |
| **METWAY ELECTRICAL INDUSTRIES, LTD.,** Canning Street, Kemp Town, Brighton, 7. | " Magnaway " | Portable reflector | 2 kW | Two 1 kW rod | Mottled silver and chromium | £3 10 0 | £0 12 7 |
| | " Mirrorway " | Portable bowl | 750 W | One 750 W spiral | Plain aluminium | £1 1 9 | £0 3 11 |
| | " Marvelway " | Portable bowl | 1 kW | One 1 kW spiral | Fluted aluminium | £1 13 3 | £0 6 0 |



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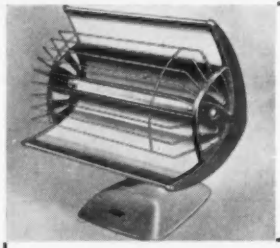

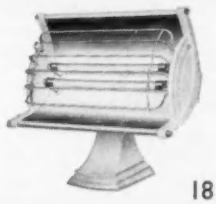

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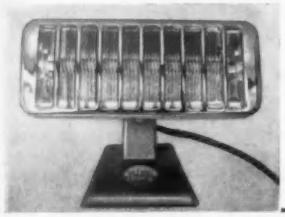
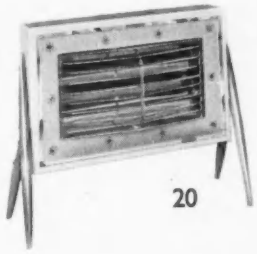
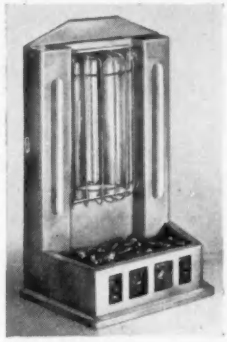


19

16. *M.E.M. "Memray" wall mounting fire*
17. *L. G. Hawkins "Loughton"*
18. *T. B. Morley & Co.'s "Humber"*
19. *Metway "Rioway"*
20. *Heatrae "Ballerina" fire fitted with wooden legs*
21. *Grafton 750 W coal-effect model*



20



21

| Manufacturer | Name or Model | Type | Total Loading | Elements | Finish | Price (excl. Tax) | Purchase Tax |
|---|---|---|---|---|---|---|---|
| **METWAY ELECTRICAL INDUSTRIES, LTD.,** Canning Street, Kemp Town, Brighton, 7. *(continued)* | "Superway" | Portable bowl | 600 W | One 600 W spiral | Plain aluminium | £0 18 6 | £0 2 8 |
| | "Modernway One" | Portable reflector | 1 kW | One 1 kW rod | Chromium and white enamel | £1 15 0 | £0 6 4 |
| | "Modernway Two" | Portable reflector | 2 kW | Two 1 kW rod | Chromium and white enamel | £2 12 6 | £0 9 5 |
| | "Rioway" | Portable reflector | 750 W | One 750 W rod | Chromium and beige | £2 2 4 | £0 7 7 |
| **MIDLAND ELECTRIC MFG. CO., LTD.,** M.E.M. Works, Reddings Lane, Birmingham, 11. | "Memray" | Wall mounting | 1 kW | One 1 kW rod | Bronze or cream | £2 5 0 | £0 8 3 |
| | "Memray" | Portable, swivelled reflector | 1 or 2 kW | One or two 1 kW rod | Bronze or cream | £2 15 0 (1 kW) £4 6 0 (2 kW) | £0 10 1 (1 kW) £0 15 9 (2 kW) |
| | "Reflex" | Portable, fixed reflector | 1 or 2 kW | One or two 1 kW rod | Mushroom or mottled stone | £2 5 0 (1 kW) £3 6 0 (2 kW) | £0 8 3 (1 kW) £0 12 1 (2 kW) |
| | "Memglo" | Portable flat bar | 1 or 2 kW | One or two 1 kW bar | Mottled stone | £1 16 4 (1 kW) £2 11 8 (2 kW) | £0 6 8 (1 kW) £0 9 5 (2 kW) |
| **T. B. MORLEY & CO., LTD.,** Jameson Street, Hull. | "Don" | Portable reflector | 750 W to 2 kW | One or two 750 W or 1 kW rod | Cream | £2 6 0 (750 W) £2 9 0 (1 kW) £2 17 0 (1½ kW) £3 2 0 (2 kW) | £0 8 5 (750 W) £0 9 0 (1 kW) £0 10 6 (1½ kW) £0 11 4 (2 kW) |
| | "Humber" | Portable reflector | 750 W or 1,500 W | One or two 750 W rod | Cream | £2 7 0 (750 W) £2 17 0 (1½ kW) | £0 8 7 (750 W) £0 10 6 (1½ kW) |
| | "Derwent" | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Cream | £2 8 0 (1 kW) £3 1 0 (2 kW) | £0 8 10 (1 kW) £0 11 2 (2 kW) |
| | "Thames" | Portable twin reflector | 750 W or 1,500 W | One or two 750 W rod | Bronze | £1 7 6 (750 W) £2 2 0 (1½ kW) | £0 5 0 (750 W) £0 7 8 (1½ kW) |

| Manufacturer | Name or Model | Type | Total Loading | Elements | Finish | Price (excl. Tax) | Purchase Tax |
|---|---|---|---|---|---|---|---|
| **T. B. MORLEY & CO., LTD.,** Jameson Street, Hull. *(continued)* | " Severn " | Portable firebar | 1 or 2 kW | One or two 1 kW bar | Bronze | £1 10 0 (1 kW) £2 5 0 (2 kW) | £0 5 6 (1 kW) £0 8 4 (2 kW) |
| | " Aire " | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Cream | £2 7 0 (1 kW) £3 0 0 (2 kW) | £0 8 7 (1 kW) £0 11 0 (2 kW) |
| | " Morco " bowl | Portable reflector | 600 W | One 600 W spiral | Cream | £1 8 6 | £0 5 3 |
| **MORPHY-RICHARDS, LTD.,** 50, Conduit Street, London, W.1. | " Avon " FA/20 | Portable reflector | 2 kW | Two 1 kW rod | Warm bronze | £4 5 0 | £0 15 4 |
| | " Cray " FC/750 and FC/15 | Portable reflector | 750 W (FC/750) and 1½ kW (FC/15) | One or two 750 W rod | Warm bronze | £2 2 0 (FC/750) £2 12 6 (FC/15) | £0 7 7 (FC/750) £0 9 6 (FC/15) |
| | " Cray " FC/10 and FC/20 | Portable reflector | 1 kW (FC/10) and 2 kW (FC/20) | One or two 1 kW rod | Warm bronze | £2 6 6 (FC/10) £2 17 6 (FC/20) | £0 8 5 (FC/10) £0 10 5 (FC/20) |
| **REELEK APPLIANCES, LTD.,** Reelek Works, Baldock, Herts. | " Popular " | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Mushroom | £1 0 0 (1 kW) £1 13 10 (2 kW) | £0 3 7 (1 kW) £0 6 1 (2 kW) |
| | " Minor " | Portable reflector | 1 kW | One 1 kW rod | Mushroom | £1 12 0 | £0 5 9 |
| | " Viceroy " | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Mushroom | £2 15 0 (1 kW) £3 7 3 (2 kW) | £0 9 11 (1 kW) £0 12 1 (2 kW) |
| | " Wizard " | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Mushroom | £2 0 0 (1 kW) £2 10 0 (2 kW) | £0 7 3 (1 kW) £0 9 0 (2 kW) |
| | " Adjustable " | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Mushroom | £2 5 0 (1 kW) £2 15 0 (2 kW) | £0 8 1 (1 kW) £0 9 11 (2 kW) |
| **REVO ELECTRIC CO., LTD.,** Tipton, Staffs. | " New Reflexam " | Wall mounting reflector | 1 or 2 kW | One or two 1 kW rod | Artshade silver and chromium | £3 8 6 (1 kW) £4 12 6 (2 kW) | £0 12 6 (1 kW) £0 16 11 (2 kW) |
| | " New-Inset " | Inset with slabbing frame | 1 or 2 kW | One or two 1 kW bar | Grey, stone, red or gold | £2 4 6 (1 kW) £3 3 0 (2 kW) | £0 8 2 (1 kW) £0 11 6 (2 kW) |
| | " New-Inset " | Inset with slabbing frame | 1 or 2 kW | One or two 1 kW rod | Grey, stone, red or gold | £2 7 6 (1 kW) £3 9 0 (2 kW) | £0 8 8 (1 kW) £0 12 7 (2 kW) |
| | " New-Outset " | Direct wall mounting | 1 or 2 kW | One or two 1 kW bar | Grey, stone, red or gold | £2 11 0 (1 kW) £3 11 0 (2 kW) | £0 9 4 (1 kW) £0 13 0 (2 kW) |
| | " New-Outset " | Direct wall mounting | 1 or 2 kW | One or two 1 kW rod | Grey, stone, red or gold | £2 14 0 (1 kW) £3 17 0 (2 kW) | £0 9 11 (1 kW) £0 14 1 (2 kW) |
| | " New Tubula " | Portable reflector | 1 or 2 kW | One or two 1 kW rod | Artshade silver and chromium | £3 12 6 (1 kW) £4 15 0 (2 kW) | £0 12 11 (1 kW) £0 17 4 (2 kW) |

22

23

24

**22.** *Revo " Wessex " screen fire*
**23.** *Simplex " Creda Cubana "*
**24.** *Morphy-Richards " Avon "*

| Manufacturer | Name or Model | Type | Total Loading | Elements | Finish | Price (excl. Tax) | Purchase Tax |
|---|---|---|---|---|---|---|---|
| **REVO ELECTRIC CO., LTD.,** Tipton, Staffs. *(continued)* | " Somerset " | Portable firebar | 1 or 2 kW | One or two 1 kW bar | Grey, green, yellow or red | £2 17 6 (1 kW) £4 3 0 (2 kW) | £0 13 3 (1 kW) £0 17 10 (2 kW) |
| | " Wessex " | Portable screen | 2 kW | Two 1 kW rod | Grey, stone, red or gold | £6 13 0 (small size) £6 16 0 (large size) | £1 4 0 (small size) £1 4 11 (large size) |
| **SIMPLEX ELECTRIC CO., LTD.,** Creda Works, Blythe Bridge, Staffs. | " Cubana " CH.352 | Portable reflector | 2 kW | Two 1 kW rod | Four two-tone colour schemes | £5 10 6 | £1 0 2 |

# ENGINEERING IN EUROPE

SURGE testing of transformers was introduced in the Lenin Works in 1942; it is clear that very valuable experience on these tests has been gathered since this time, and the essentials of the method now used and development of the equipment is reported in this paper. The basic method used is Hagenguth's, that is, the measurement of the current at the neutral point of the impulsed winding or coil, and faults caused by the tests are detected from the dissimilarities of oscillograms taken during the application of rising test voltages. Elsner's test method, using the currents transmitted by capacitive or inductive coupling to the non-impulsed windings and/or phases, is as reliable as Hagenguth's.

In the Lenin Works the two methods are used alternatively as well as combined. Low-voltage tests on transformers in the dry state are invariably carried out. The main test generator is an A.E.G.-built eight-stage Marz generator for 1,800 kV, 32·4 kW, but there is a smaller, portable Haefely surge generator for 450 kV and 1·25 kW as well. This is mainly used for testing models of transformers, components and apparatus, winding sections, etc., and, in addition, there are a small thyratron surge generator for 20 kV and a repeated impulse generator for 500 V and 1,000 V. Among the measuring instruments described in great detail are a diode voltmeter and a peak voltmeter with cathode followers. Some test circuits are shown and examples of tests carried out are reported, with a picture of windings undamaged and damaged by the tests. — " Surge and Dynamic Tests on Transformers in the Lenin Works, Pbzen," B. Hrbek, K. Barta and J. Ronovsky, *Elektrotech. Obzor*, Vol. 48, No. 5, pp. 248-256, May, 1959, in Czech.

## Arc Quenching Chambers

The conventional method of arc quenching in d.c. circuit-breakers was by magnetic fields set up by blow-out coils, but more recently, high-speed d.c. breakers have been developed in which a magnetic deflection obtained without blow-out coils proper is used to lengthen the arc very rapidly thus causing more rapid arc extinction. Further progress has now been made and an even quicker quenching system for d.c. breakers has been evolved which is also of an unprecedented small size.

It is arranged to exert a double magnetic deflecting force on the arc in two directions normal to each other. The arc is driven upwards by its own magnetic field along two slots in sheet metal " quenching towers " towards a stop bracket and is divided into three branches, two of which are vertical and one horizontal. Horizontal blow-out slots in the towers contribute to producing this configuration of the arc, while the stop bracket enables the peak value of the arc voltage to be adjusted to any desired value. An additional quenching chamber with narrowing slot and eddy current damping allows the arc voltage to be kept almost constant during the breaking process. It is shown that the field strength along the arc depends on the magnetic force exerted on the arc, and therefore on the arc current. This makes the character of the variation of the arc voltage during the breaking process explicable. An empirical relationship between arc voltage, current and magnetic force on the arc is presented.—" Investigations on Arcs in Novel Quenching Chambers for High-Speed D.C. Circuit-Breakers," F. Wegmann, *Elektrotech. Z. (E.T.Z.)-A*, Vol. 80, No. 10, pp. 289-295, 11th May, 1959, in German.

## H.V. Mercury Rectifiers

In operation in a powerful h.v. system the h.v. rectifier units may pass without damage currents exceeding the current at which the arc is extinguished at a low voltage. However, if this current of arc interruption at a low voltage is less than several hundred A, surges and current interruptions will also occur at high voltages. With periodically repeated current interruptions the valve may rapidly become unserviceable owing to anode splutter by fast electrons. The voltage distribution in the anode unit sections is non-uniform.

In rectifier operation the load is carried by the section nearest to the anode, in invertor operation, by the section farthest away, and when the discharge is formed, negative voltages are set up on the intermediate electrodes owing to their non-simultaneous ignition. To improve the operation of the rectifiers, it is recommended that a resistive voltage divider to remove the charges from the intermediate electrodes should be connected. Surges may be set up on all the electrodes of a h.v. valve. All the insulated electrodes must have bushings (lead-outs) and be protected by divertors. These divertors must be calculated for the operating voltage co-ordinated with the insulation of the circuits of the auxiliaries and for a current equal to the maximum possible current in the circuit of the main anode.—" Investigation of the Electrical Characteristics of H.V. Mercury Rectifier Valves," A. A. Sakovich, *Elektrichestvo*, No. 5, pp. 14-17, 1959, in Russian.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

***Financial Section***

# STOCKS and SHARES

UP to now, the long steep rise in industrial share prices, which has been in progress now for a year and a half, has been led for much of the time by the shares of companies concerned with consumer goods; in the electrical markets many of the best performances have been associated with the production or distribution of household appliances of one sort and another, especially of course since last year's relaxation of the hire-purchase regulations and reduction of purchase tax. Examples are the shares of Hoover, Vactric, Morphy-Richards, Bulpitts and Berry's Electric. Investments in the makers of capital plant and equipment have, on the whole, moved more slowly, but have noticeably been attracting more attention lately on the accumulation of evidence that these sides of industry are responding also to their release from the credit squeeze and to the other Government encouragements to industrial expansion.

## Capital Equipment

Evidence of the revival of interest in the makers of capital equipment has been apparent among the shares of the major electrical organisations. It was stimulated by news of the plans for co-operation between the A.E.I.-John Thompson and the Parsons-Reyrolle nuclear power groups. The principal movement here has been a rise in the price of A.E.I. shares from about 55s 6d to 63s within the past month or so. In the same time, English Electric have come up from 41s 6d to 45s, C. A. Parsons from 44s to 47s 6d, and G.E.C. from 34s to 37s 6d. Among heavy engineering shares the rise in Babcock & Wilcox shares from 46s 6d to 53s 9d has been the feature in recent weeks, while others such as Head, Wrightson and Clarke Chapman have also moved upwards.

## Consumer Goods

Although quieter than of late, many of the shares connected with domestic and other light electrical equipment have retained a strong following, encouraged by such news as was contained in Hoover's interim report issued at the end of last month. This disclosed that group net profits in the first six months of this year were three times as large as those earned in the corresponding half of 1958, and greater indeed than the whole of that year's profits. At the same time, shareholders were advised that it would be difficult to maintain the present high level of sales either in home or export markets, and that it was the directors' intention to finance a new programme of major capital expenditure out of the company's own resources. This intimation, with the announcement of an unchanged interim distribution, caused a revision of the more optimistic dividend estimates for the current year, but the 5s shares have been well sustained at 74s 6d.

## Good Features

S. Smith & Sons 4s shares have been outstandingly strong over the

## *Price Changes in*

| Company or Board | Nom. Value | Middle price 17th Aug. | Week's Rise or Fall | Dividend Previous | Dividend Last | Yield % | 1959 Highest | 1959 Lowest |
|---|---|---|---|---|---|---|---|---|
| *Gilt-edged Stocks* | | | | | | £ s d | | |
| Brit. Elec. 1968/73 | 100 | 79½ | −½ | 3 | 3 | 3 15 6 | 80½ | 77½ |
| Brit. Elec. 1974/77 | 100 | 75½x.d. | | 3 | 3 | 3 19 6 | 77 | 74½ |
| Brit. Elec. 1976/79 | 100 | 80½ | | 3½ | 3½ | 4 7 0 | 80½ | 77½ |
| Brit. Elec. 1974/79 | 100 | 91 | | 4½ | 4½ | 4 13 6 | 91 | 87½ |
| *Overseas Electric Supply* | | | | | | | | |
| Calcutta Elec. | £1 | 19/- | −6d | 6·8† | 7† | 11 18 0 | 19/6 | 16/- |
| East African Power | £1 | 20/6 | +6d | 7½ | 8 | 7 16 0 | 22/3 | 19/3 |
| Nigerian Elec. | £1 | 13/6 | +6d | 8 | 8 | 11 17 0 | 15/- | 13/- |
| Perak Hydro-Elec. | £1 | 14/- | +6d | 12½ | 10 | 14 5 3 | 14/6 | 12/3 |
| *Electrical Shares* | | | | | | | | |
| Aberdare Holdings | 5/- | 16/9 | | 17½ | 17½ | 5 4 6 | 16/9 | 15/6 |
| Aerialite | 1/- | 8/6 | +3d | 51½ | 54 | 6 7 0 | 9/6 | 7/9 |
| Allen, W. H. | £1 | 51/3 | | 11 | 12 | 4 13 9 | 51/3 | 43/- |
| Allied Insulators | 5/- | 20/- | | — | 20‡ | 5 0 0 | 20/- | 18/9 |
| Anglo-Portuguese Tel. | £1 | 29/- | −3d | 9 | 9 | 6 4 3 | 29/3 | 26/6 |
| Aron Elec. Ord. | £1 | 55/- | | 15 | 15 | 5 9 0 | 62/6 | 55/- |
| Assoc. Elec Ord. | £1 | 63/- | −6d | 15 | 15 | 4 15 3 | 63/6 | 53/9 |
| Automatic Tel. & El. | £1 | 75/- | +3/9 | 17 | 17‡ | 4 10 9 | 82/6 | 71/3 |
| Babcock & Wilcox | £1 | 53/9 | −9d | 13½ | 13 | 4 16 9 | 54/6 | 45/6 |
| Bakelite | 10/- | 31/3 | | 15 | 15 | 4 16 0 | 31/3 | 22/- |
| Baldwin, H. J. | 2/- | 2/3 | −3d | 20 | 20 | — | 3/- | 2/3 |
| Berry's Electric | 5/- | 28/6 | +6d | 10 | 20 | 3 10 3 | 28/- | 10/9 |
| Bowthorpe Holdings | 2/- | 14/- | +3d | 25 | 27 | 3 17 3 | 15/6 | 11/9 |
| British Elec. Traction: Def. Ord. "A" | 5/- | 38/6 | −6d | 25 | 35 | 4 11 0 | 40/- | 35/6 |
| B.I. Callender's | £1 | 52/- | +9d | 12½ | 13½ | 5 3 9 | 56/6 | 44/9 |
| B.I. Callender's 6% Pref. | £1 | 20/- | | 6 | 6 | 6 0 0 | 20/6 | 19/9 |
| British Thermostat | 5/- | 24/6 | | 30 | 35 | 3 11 9* | 25/- | 18/6 |
| British Vac. Cleaner | 5/- | 7/- | | 10 | 7½* | 5 7 0 | 7/9 | 4/6 |
| Brook Motors | 10/- | 48/9 | | 25 | 24½* | 4 19 0 | 54/3 | 46/- |
| Bulgin, A. F. | 1/- | 9/- | | 45 | 50 | 5 11 0 | 10/- | 6/9 |
| Bulpitts | 5/- | 18/3 | +1/- | — | 15 | 4 2 3 | 18/3 | 10/- |
| Burco Dean | 5/- | 15/9 | | 22½ | 16* | 5 1 6 | 15/9 | 12/3 |
| Cable & Wireless: Ord. | 5/- | 15/- | +9d | 10 | 10* | 3 6 9 | 15/- | 12/3 |
| 4% Loan | 100 | 94½ | | 4 | 4 | 4 4 9 | 95 | 93 |
| Chloride El. Storage "A" | £1 | 55/- | +2/6 | 17½ | 20‡ | 4 17 6* | 55/- | 43/8 |
| Clarke Chapman | £1 | 52/6 | | 27½ | 13¾* | 5 4 9 | 66/3 | 52/6 |
| Cole, E. K. | 5/- | 21/3 | +3d | 17½ | 20 | 4 14 0 | 21/3 | 17/3 |
| Contactor Switchgear | 5/- | 15/- | | 20 | 14* | 4 13 3 | 15/- | 12/- |
| Cossor, A. C. | 5/- | 8/3 | +9d | 2½ | Nil | Nil | 9/- | 6/3 |
| Crabtree | 10/- | 30/3 | | 20 | 20 | 6 12 3 | 31/6 | 28/- |
| Crompton Parkinson | 5/- | 13/9 | +3d | 16 | 12* | 4 7 3 | 14/3 | 11/9 |
| Davis & Timmins | 5/- | 17/- | | 18 | 20 | 5 17 9 | 17/- | 14/6 |
| De La Rue | 10/- | 50/- | −1/3 | 17½ | 20 | 4 0 0 | 54/- | 30/3 |
| Decca "A" | 10/- | 36/- | +1/- | 43½ | 50 | 5 11 0* | 40/3 | 33/3 |
| Desoutter | 5/- | 27/6 | | 32½ | 21½*‡ | 3 18 9 | 27/6 | 19/- |
| Dewhurst | 2/- | 8/3 | | 20 | 20 | 4 16 9 | 8/3 | 7/3 |
| Dictograph Tel. | 2/- | 7/6 | | 20 | 20 | 5 6 9 | 8/3 | 7/- |
| Dubilier Condenser | 1/- | 4/6 | | 20 | 25 | 5 11 0 | 5/- | 3/3 |
| Duport | 5/- | 12/9 | +1/- | 25 | 12½* | 4 18 0 | 12/9 | 10/3 |
| E.M.I. | 10/- | 51/9 | +3d | 15 | 20*‡ | 3 17 3 | 64/6 | 48/- |
| Electrical Apparatus | 5/- | 13/9 | | 12½ | 14½ | 5 5 6 | 14/- | 13/- |
| Electrical Components | 5/- | 15/9 | +1/6 | 12½ | 15 | 4 15 3 | 15/9 | 10/6 |
| Elec. Construction | £1 | 33/6 | | 8½ | 9 | 5 7 6 | 33/6 | 27/9 |
| Elliott-Automation | 5/- | 23/9 | | — | 10‡ | 2 2 0 | 30/6 | 16/9 |
| Enfield Cable Ord. | £1 | 21/3 | | 2½ | Nil | — | 22/3 | 16/3 |
| English Electric | £1 | 45/- | +3d | 14 | 14 | 4 3 0* | 45/- | 37/10 |
| English Electric 3½% Pref. | £1 | 13/- | | 3½ | 3½ | 5 15 6 | 12/9 | 12/3 |
| Ericsson Tel. | 5/- | 22/3 | | 12† | 13† | 5 1 6 | 27/3 | 22/3 |
| Ever Ready | 5/- | 24/- | +2/- | 20 | 27½‡ | 3 8 9* | 24/- | 13/3 |
| Falk Stadelmann | £1 | 25/- | | 17½ | 10*‡ | 8 0 0 | 32/9 | 25/- |

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

past week or so, the price rising 2s to 16s 3d, and Lucas have also had their share of an active demand for investments in the companies which supply accessories to the booming motor-car industry. Both these companies have just closed their financial years and may be expected to declare the results in three months' time. Sun Electrical, now 15s 9d, added another 2s to the substantial rise in the price which had already taken place as a sequel to the company's capital reorganisation scheme, involving a 100 per cent scrip issue and the sub-division of the £1 shares into 5s units. Hackbridge & Hewittic were quoted ex the one-for-three scrip issue, and 1s higher at 13s 6d: the recently issued annual report said that full capacity working was assured this year in all divisions. Newman Industries improved further to 3s 6d, and others to record new high levels for the year included Bulpitts, Chloride Electrical and Ever Ready.

## Electrical Investments

| Company or Board | Nom. Value | Middle price 17th Aug. | Week's Rise or Fall | Dividend Previous | Dividend Last | Yield % | 1959 High-est | 1959 Low-est |
|---|---|---|---|---|---|---|---|---|
| *Electrical Shares—continued* | | | | | | £ s d | | |
| G.E.C. | £1 | 37/6 | −9d | 10 | 10 | 5 6 9 | 40/3 | 31/3 |
| G.E.C. 6½% Pref. | £1 | 22/- | | 6½ | 6½ | 5 18 3 | 22/- | 20/3 |
| General Cables | 5/- | 8/3 | −6d | 24 | 15 | 9 2 0 | 9/3 | 7/6 |
| Greenwood & Batley | £1 | 105/- | | 20 | 30 | 5 14 3 | 105/- | 75/- |
| Hackbridge Holdings | 5/- | 17/3 | −2/- | 20 | 20 | 5 16 0 | 19/3 | 14/3 |
| Hackbridge & Hewittic | 5/- | 13/6x.c. | +1/- | 20 | 20 | 5 11 0* | 13/6 | 10/6 |
| Head Wrightson | 5/- | 29/6 | +2/- | 17½ | 20 | 3 7 9 | 29/6 | 24/3 |
| Heatrae | 2/- | 8/- | | 20 | 20 | 5 0 0 | 10/- | 7/6 |
| Holophane | 5/- | 17/6 | +9d | 37½ | 22½* | 6 8 6 | 17/6 | 14/9 |
| Hoover | 5/- | 74/6 | | 50 | 60 | 4 0 6 | 74/6 | 55/- |
| I.C.I. | £1 | 40/- | +1/6 | 12 | 8* | 4 1 0 | 40/- | 33/- |
| Intl. Combustion | 5/- | 33/9 | | 25 | 30‡ | 4 9 0 | 36/6 | 29/9 |
| Intl. Computers & T. | £1 | 65/6 | −9d | — | 8‡ | 2 8 9 | 78/9 | 57/6 |
| Johnson & Phillips | £1 | 22/6 | −6d | 5 | 5 | 4 9 0 | 30/6 | 22/- |
| Lancashire Dynamo | £1 | 42/6 | | 11 | 12½‡ | 4 8 3* | 43/1 | 31/6 |
| Laurence Scott | 5/- | 16/9 | | 15 | 15 | 3 3 9* | 16/9 | 14/- |
| Lister, R. A. | £1 | 39/6 | | 10 | 12½ | 6 6 6 | 41/- | 32/9 |
| Lucas, J. | £1 | 52/6 | +1/3 | 7½ | 10‡ | 3 16 3 | 52/6 | 43/3 |
| Marconi Marine | £1 | 42/- | | 10 | 10 | 4 15 3 | 48/6 | 40/- |
| Marryat & Scott | 2/- | 9/9 | | 37½ | 22½* | 4 12 3 | 10/- | 8/6 |
| Mather & Platt | £1 | 43/- | | 15 | 10‡* | 4 19 3 | 51/6 | 41/3 |
| Metal Industries | £1 | 55/9 | +2/- | 14 | 14 | 5 0 3 | 55/9 | 39/9 |
| Midland Elec. Mfg. | £1 | 45/- | | 12½ | 10* | 4 9 0 | 45/- | 41/6 |
| Morphy-Richards | 4/- | 28/- | | 20 | 20 | 2 17 3 | 28/- | 18/- |
| Murex | £1 | 47/6 | −2/- | 17½ | 15 | 6 6 3 | 49/6 | 42/- |
| Newman Ind. | 2/- | 3/6 | +6d | 10 | 10 | 5 14 3 | 3/6 | 2/3 |
| Oldham & Son | 1/- | 2/9 | | 17½ | 17½ | 6 7 3 | 3/- | 2/6 |
| Parsons, C. A. | £1 | 47/6 | +1/9 | 7½ | 8½‡ | 3 8 6 | 55/9 | 45/9 |
| Philips' Lamps | Fl.10 | 122/6 | −3/9 | 14 | 14 | 2 3 0 | 126/3 | 88/- |
| Plessey | 10/- | 32/6 | +1/- | 30 | 30 | 3 1 6* | 32/6 | 23/6 |
| Pye | 5/- | 14/6 | | 12½ | 12½ | 4 6 3 | 16/9 | 13/9 |
| Pyrotenax | 5/- | 37/- | +9d | — | 34 | 4 12 0 | 38/3 | 33/9 |
| Reliance Clifton | 5/- | 22/- | | 15 | 15 | 3 8 3 | 22/- | 17/6 |
| Reyrolle | £1 | 88/9 | +1/3 | 17½ | 17½ | 3 19 0 | 98/- | 85/9 |
| Rheostatic | 4/- | 9/9 | | 12½ | 12½ | 5 2 6 | 10/9 | 8/3 |
| Richardsons Westgarth | 10/- | 12/- | | 8½ | 8½ | 6 18 9 | 15/3 | 12/- |
| Simon-Carves | 5/- | 28/9 | | 25 | 25 | 4 7 0 | 32/- | 28/6 |
| Smith (England), S. | 4/- | 16/3 | +2/- | 20 | 12½*‡ | 3 1 6 | 17/- | 11/6 |
| Southern Areas | £1 | 13/6 | | Nil | Nil | Nil | 15/- | 10/6 |
| Strand Elec. | 5/- | 10/3 | | 15 | 15 | 7 6 3 | 10/3 | 8/6 |
| Sturtevant | 5/- | 17/9 | +6d | 15† | 15† | 6 18 0 | 20/- | 17/- |
| Sun Elec. | 5/- | 15/9 | +2/- | 25 | 25 | 3 19 3* | 15/9 | 8/3 |
| Switchgear & Cowans | 5/- | 13/9 | +3d | 22½ | 15* | 5 9 0 | 13/9 | 10/3 |
| T.C.C. | 10/- | 43/9 | | 25 | 25 | 5 14 3 | 43/9 | 38/- |
| Telephone Mfg. | 5/- | 6/3 | +9d | 10 | 10 | 8 0 0 | 6/3 | 4/9 |
| Telephone Rentals | 5/- | 16/9 | | 12½ | 12½* | 3 14 9 | 16/9 | 11/9 |
| Thompson (John) | 5/- | 21/- | | 25 | 25 | 5 19 0 | 25/6 | 22/9 |
| Thorn Elec. | 5/- | 36/3 | +2/6 | 17½ | 20 | 2 15 3 | 38/6 | 26/3 |
| Thornycroft | £1 | 30/- | +5/- | 12½ | 7½ | 5 0 0 | 30/- | 20/6 |
| Tube Investments | £1 | 87/9 | | 15 | 17½ | 3 19 9 | 87/9 | 71/6 |
| Vactric | 5/- | 41/- | −1/- | 25 | 37½ | 4 11 6 | 44/6 | 26/3 |
| Veritys | 5/- | 1/6 | | 12½ | 2½ | — | 5/- | 1/3 |
| Walsall Conduits | 4/- | 12/- | +9d | 22½ | 22½ | 4 4 6* | 14/2 | 10/8 |
| Ward & Goldstone | 5/- | 44/- | +1/- | 25 | 30 | 3 8 3 | 44/- | 30/6 |
| Watford | 2/- | 9/3 | +9d | 25 | 25* | 5 8 0 | 9/3 | 7/6 |
| Westinghouse | £1 | 42/6 | | 10 | 10 | 4 14 3 | 47/- | 39/6 |
| West, Allen | 5/- | 12/6 | +3d | 12½ | 11½* | 4 13 0 | 14/- | 11/9 |
| Wolf Electric | 5/- | 7/9 | | 10 | 10 | 6 9 0 | 8/6 | 7/9 |

### Thorn Electrical Report

Thorn Electrical Industries' 5s shares, quoted at 36s 3d (with the "A" shares at 32s 6d), reacted well to the chairman's review of the group's affairs in the annual report. This provides a good background for the company's plans to raise about £5½ million new capital, of which £2½ million is to come from a "rights" issue of ordinary shares and the balance in the form of a loan stock. As reported previously, the net profit for the year ended last March expanded by nearly £300,0000 to £979,000 (after tax) and the ordinary dividend has been raised from 17½ to 20 per cent. The fourfold earnings cover for the latter, and anticipation of the "rights" issue, are among the factors in the quotation of the shares on a yield basis of less than 3 per cent.

### Ward & Goldstone

Over the past five years, Ward & Goldstone have spent more than £2 million on improving operational efficiency while being able at the same time to give shareholders a continuously increasing return on their investment and to accumulate reserves large enough for likely future requirements. The progressive record, coupled with the strength of the financial position, is recognised in the relatively modest yield of about 3½ per cent on the company's 5s ordinary shares at a price of 44s. For the year ended last March the maintenance of the group trading profit at a little over the million mark, subject to a lower tax provision, made very ample provision for a 5 per cent increase in the dividend to a total of 30 per cent.

### Pyrotenax Results

Successful results appeared in the first annual report to be issued by Pyrotenax since the marketing of the 5s ordinary shares last October. Starting then at about 27s 6d, the quotation has since steadily improved to 37s. A final dividend of 17½ per cent made for 1958–59 a total of 30 per cent, or 2½ per cent more than the rate forecast in the prospectus, and was supplemented by a 4 per cent bonus. The yield on the shares works out at 4·6 per cent on the whole distribution, or 4·1 excluding the extra payment, which is related to favourable purchases of raw materials and not necessarily of a recurrent nature. Net profits, after tax, increased by more than a quarter to £392,000 and covered some 2½ times the amount of the full distribution.

# REPORTS and DIVIDENDS

**Thorn Electrical Industries, Ltd.**—The annual meeting will be held on 4th September. In his statement, which has been circulated to shareholders, Mr. J. Thorn (chairman and managing director) says that the fully-owned subsidiary, Atlas Lighting, Ltd., continues to flourish and has had another record year, both in turnover and profit. They have maintained their position as the largest manufacturers of fluorescent tubes; the price of the 8ft tube has been reduced and further increases in tube efficiencies have been made. There have been several important developments, notably the introduction of the Atlas "Tru-flector" projector lamp. Since the removal of restrictions which limited new building work, the fluorescent fittings business has gone ahead rapidly and continues to show the same trend. They have recently announced the production of the millionth Atlas "Popular Pack" and a complete redesign. The Street-lighting Department continues to make progress and they have introduced several new lanterns.

In the lighting field, orders in hand are well ahead of last year. Ekco Ensign Electric, Ltd., their associated company, continues to make its contribution to the lighting business and its new "Essex" range of fluorescent fittings has been outstandingly successful.

Referring to the radio and television side of the business, the chairman says that the removal of credit restrictions last autumn led to a substantial increase in home sales. With regard to their arrangements with Electric & Musical Industries, Ltd., by which they produce "His Master's Voice" and Marconiphone radio and television receivers, the growing success of British Radio Corporation, Ltd., with these well-known trade marks is indicated by the fact that in the first three months of the current financial year their turnover in the home market has been doubled, compared with the corresponding period of 1958. Since 1st April last they have acquired the Philco business in this country. In the export field progress in radio and television sales has not been so rapid as might have been hoped, but overseas trading results in the lighting business continue to improve. The aircraft components and connector division has made rapid strides during the period under review, and the position of Tricity Cookers, Ltd., in the domestic cooker market has been further strengthened by the success of the "Viscount" and "Marquis" cookers for which the demand continues to outstrip their production capacity; a further 40,000 sq ft is being added to the Spennymoor works. Tricity has recently introduced a "built-in" electric cooker, the first of its kind in this country, and other new products are to be introduced during the current financial year.

Following the annual general meeting an extraordinary general meeting will be held at which resolutions will be submitted for raising £5½ million, of which £2½ million will be obtained by a rights issue of ordinary shares to holders of the ordinary and "A" ordinary shares, the balance being raised by a new issue of unsecured loan stock.

**Berry's Electric Magicoal, Ltd.**—In his statement, which has been circulated with the report and accounts for the year ended 31st March last, Mr. R. Berry (chairman and managing director) says that the year has been a record one both in volume of sales and profit. There has been a considerable increase in the demand for "Magicoal" fires and the sale of water heaters, lighting fittings and switchgear has been maintained or increased.

Export sales have increased in spite of prevailing difficulties in many areas, and in the United States and Canada sales during the year have almost doubled. It has become necessary to expand the capacity to manufacture the special fires for the American market and the company is acquiring a site in Bicester upon which it will shortly commence the building of a new factory. During the year many new models, improved existing designs and new products have been introduced. These include the "Warm-Welcome" domestic time switch and more recently an entirely new electric food-mixing machine. In the current year sales for the first quarter attained a record level and prospects for the rest of the year appear to be extremely favourable.

**Southern Areas Electric Corporation, Ltd.**—In his statement covering the year 1958, Lord Gridley (chairman) says that it has been another disappointing year as regards the intake of orders. There seems an inclination by many concerns, whose productive capacity is at the present time not being fully utilised, to defer ordering new equipment to replace older. Their largest subsidiary, Mawdsley's, Ltd., in particular has found this to be so, and the orders obtained in 1958 were nearly one-third lower in value than in 1957. The reduced Government expenditure for the defence services, the difficult position of the shipping industry, and increased competition generally, have adversely affected the trading results of lighter engineering industries such as theirs.

**Christy Bros., Ltd.**—Group profits for the year to 31st March last were £70,836, as compared with £78,634 for the previous year, but after a lower taxation charge of £35,487 (against £41,804) the net balance is £35,349 (against £36,830). A sum of £18,000 is placed to a subsidiary's general reserve and it is proposed to pay a dividend for the year of 8 per cent (against 7 per cent). The balance carried forward is £47,364 (£43,702).

**The English Electric Co., Ltd.**, has declared an interim dividend of 3 per cent (against 4 per cent) on capital as increased by the scrip issue in May last. It is stated that the interim dividend carries no implication as to the total payment for the year.

**Hackbridge Holdings, Ltd.**, reports a group profit for 1958-59 of £137,496, as compared with £134,748 for 1957-58. Taxation absorbs £124,326. It is proposed to pay a final dividend of 12½ per cent, maintaining the distribution for the year at 20 per cent.

**Hall-Thermotank, Ltd.**, has declared an interim dividend of 1¼ per cent on a capital doubled by a scrip issue and increased by the merger with Thermotank.

**Desoutter Brothers (Holdings,) Ltd.**, has declared an interim dividend of 6¼ per cent (unchanged).

**The Rheostatic Co., Ltd.**, is paying an interim dividend of 6 per cent (against 5 per cent).

## Liquidation

**Norman Electrics, Ltd.**—Winding up voluntarily. Liquidator, Mr. K. R. Cork, 19, Eastcheap, London, E.C.3.

## Bankruptcies

**M. T. Goldberg,** lately carrying on business under the style of Malcolm Electronics at 35a, Brookfield Road, Hackney, London, E.9, as a television, radio and electrical appliance retailer.—Public examination 30th October at Bankruptcy Buildings, Carey Street, London, W.C.2.

**W. H. Rosindale,** lately carrying on business as an electrical contractor at 12 and 14, Paragon Arcade, Paragon Street, Hull.—Application for discharge to be heard on 16th September at the Guildhall, Hull.

**K. R. Clover,** trading as K. R. Clover & Co., at 3, Market Cross, Sturminster Newton, Dorset, radio and electrical engineer.—Order made 10th July suspending discharge until 10th January, 1960.

**F. W. Ames,** 73, Havelock Road, Bognor Regis, electrician.—Trustee, Mr. T. H. Parker, 8, Old Steine, Brighton, 1, Official Receiver, released 4th August.

**N. D. Keene,** trading as N. & D. Keene, at 78, Llewellyn Street, Pontygwaith, Glam., radio, television and electrical contractor.—Trustee, Mr. W. H. Meredith, County Court Buildings, Westgate Street, Cardiff, Official Receiver, released 4th August.

**S. Green,** 373, Bolton Road, Darwen, Lancs., electrical contractor.—Last day for receiving proofs for dividend 21st August. Trustee, Mr. J. Tye, 20, Byrom Street, Manchester, 3, Official Receiver.

**A. Childs,** trading as Vac Rebuilds of 34, Gorsedale Road, Liverpool, electrical dealer, lately carrying on business at 19, Slater Street, Liverpool.—Receiving order made 5th August on a creditor's petition.

**D. Macintyre,** Flat 1, "Mayfield," Bray Road, Maidenhead, Berks., lately residing at 196, Courthouse Road, Maidenhead, electrical engineer.—First meeting 25th August at 58-61, York Terrace, Regent's Park, London, N.W.1. Public examination 28th October at the Law Courts, Windsor Road, Slough.

**H. P. Merken,** 22, Petherton Road, Highbury, London, N.5, formerly an electrical contractor.—Last day for receiving proofs for dividend 26th August. Trustee, Mr. A. A. Walter, Bankruptcy Buildings, Carey Street, London, W.C.2, Official Receiver.

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# NEW PATENTS

## Electrical Specifications Recently Published

*The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2*

**1954**

15593. Jackson, S. W.—Electromagnetic relays. 25th August, 1955. (815642.)

25582. Ferranti, Ltd., and Sykes, B.—Apparatus for forming artificial targets. 2nd December, 1955. (815729.)

27903. General Electric Co., Ltd.—Sodium vapour electric discharge lamps. 19th September, 1955. (815893.)

28169. Electric & Musical Industries, Ltd.—Amplifiers having wideband coupling networks. 28th September, 1955. (815896.)

**1955**

7347. Fielden Electronics, Ltd.—Electrical pressure transducers. 7th June, 1956. (815732.)

10757. General Electric Co., Ltd.—Electric discharge lamps. 15th March, 1956. (815782.)

12596. Cole, Ltd., E. K., and King, A. E.—Electrical inductance coils. 30th April, 1956. (815820.)

14214. Pye, Ltd.—Static eliminator for gramophone records. 17th May, 1956. (815734.)

17967. Landis & Gyr A.G.—Apparatus for telemetering and integrating impulses from a number of measuring stations in a central recording station. 21st June, 1955. (815903.)

17985. Guardigli, P.—Electrically operated force amplifiers, particularly for the remote control of measuring apparatus. 21st June, 1955. (815735.)

21827. M-O Valve Co., Ltd.—Manufacture of thermionic valves. 26th October, 1956. (815571.)

21828. General Electric Co., Ltd.—Electrolytic treatment of metallic surfaces. 26th October, 1956. (815572.)

22618. Siemens Edison Swan, Ltd.—Electronic apparatus. 17th July, 1956. (815589.)

24023. General Electric Co.—Humidity sensitive devices. 19th August, 1955. (815646.)

25341. Sumitomo Electric Industries, Ltd.—Insulated electric conductors. 2nd September, 1955. (815573.)

25619. McMillan, E. B., and Redheffer, R. M.—Dielectric walls for transmission of centimetric radiation. 7th September, 1955. (815575.)

30828. Sylvania Electric Products, Inc.—Television receiver. 27th October, 1955. (815715.)

31279. Cole, Ltd., E. K., and Knight, A. J.—Inductance coils. 1st November, 1956. (815595.)

33074. International Business Machines Corporation.—Electric calculators and accumulators therefor. 18th November, 1955. (815751.)

33112. Sylvania Electric Products, Inc.—Television receiver. 18th November, 1955. (815716.)

34211. Carr Fastener Co., Ltd.—Electric lamp housings. 26th November, 1956. (815598.)

35464. Stokes & Sons, Ltd., J.—Electric fencing standards and insulators therefor. 8th March, 1957. (Cognate application 14946, 14th May, 1956.) (815755.)

36412. Worton, H.—Device for holding a telephone instrument and accessories associated therewith. 18th December, 1956. (815822.)

36658. General Electric Co.—Communication systems. 21st December, 1955. (815601.)

**1956**

1460. Sylvania Electric Products, Inc.—Electroluminescent lamp. 16th January, 1956. (815720.)

3664. General Electric Co., Ltd., and Robinson, A. S.—Oscillator circuits incorporating junction transistors. 12th December, 1956. (815911.)

4262. Standard Telephones & Cables, Ltd.—Electronic equipment practice. 10th February, 1956. (Addition to 806835.) (815912.)

9395. Sumitomo Electric Industries, Ltd.—Insulated conductor for electric communication cables. 26th March, 1956. (815574.)

10296. Richardsons, Westgarth & Co., Ltd., and Frankel, A.—Evaporators. 28th March, 1957. (815796.)

11834. Submarine Cables, Ltd.—Cable anchoring means for submarine cable repeater apparatus. 6th May, 1957. (815653.)

11937. National Distillers & Chemical Corporation.—Electrolysis cell. 19th April, 1956. (815922.)

16245. Western Electric Co., Inc.—Electrical signal amplifying systems. 25th May, 1956. (815611.)

16570. Eitel-McCullough, Inc.—Electron tube envelope structure. 29th May, 1956. (815655.)

21181. Sperry Rand Corporation.—Amplifier for pulse type signals. 9th July, 1956. (815614.)

22048. Electric Storage Battery Co.—Electric storage batteries. 17th July, 1956. (815726.)

22051. Electric Storage Battery Co.—Method of preventing deterioration during storage of electric batteries. 17th July, 1956. (815727.)

27391. Bylock Electric, Ltd.—Floor polishing machines. 14th August, 1957. (815623.)

28046. Collins Radio Co.—Electromechanical filters. 13th September, 1956. (815579.)

28138. Westinghouse Electric International Co.—Electric control systems. 14th September, 1956. (815929.)

31055. Collins Radio Co.—Frequency stabilisation system employing phase shifting means with resonant sections. 11th October, 1956. (815580.)

32265. Western Electric Co., Inc.—Electron discharge devices including magnetic-focusing arrangements. 23rd October, 1956. (815836.)

32587. Standard Telephones & Cables, Ltd.—Electric cable joint including loading coils. 18th October, 1957. (815837.)

32704. Western Electric Co., Inc.—Communication systems. 26th October, 1956. (815632.)

34135. General Motors Corporation.—Electrical current and voltage regulation devices. 8th November, 1956. (815635.)

34519. English Electric Valve Co., Ltd.—Thyratrons. 11th July, 1957. (815636.)

35315. Texas Instruments, Inc.—Transducer assembly. 19th November, 1956. (815933.)

37078. British Insulated Callender's Cables, Ltd.—Junction and terminal boxes for electric cables and terminals therefor. 4th December, 1957. (815664.)

37352. Zirconal, Ltd.—Electric arc furnaces. 27th November, 1957. (815935.)

39620. Westinghouse Electric International Co.—Electric control systems for rolling mills. 31st December, 1956. (815665.)

**1957**

2794. Metropolitan-Vickers Electrical Co., Ltd.—Electrical insulation bushing assemblies. 24th December, 1957. (815853.)

3280. Mullard, Ltd. — Invertor circuits employing transistors. 30th January, 1957. (815668.)

3738. Erie Resistor Corporation.—Electric circuit assembly. 4th February, 1957. (815669.)

4290. Sylvania Electric Products, Inc.—Photoconductive cells. 7th February, 1957. (815670.)

8597. Standard Telephones & Cables, Ltd.—Photoconductive cadmium sulphide powder. 15th March, 1957. (815674.)

9765. Bendix Aviation Corporation.—Electrical wiring harness. 25th March, 1957. (815762.)

9860. Philips Electrical Industries, Ltd.—Ferromagnetic ferrite materials. 26th March, 1957. (815676.)

9987. Imperial Chemical Industries, Ltd., and Deutsch, K.—Electrode for arc melting. 24th March, 1958. (815867.)

11253. Wilcolator Co.—Electric switch actuating mechanism. 5th April, 1957. (815679.)

11372. Hazeltine Corporation.—Chrominance signal demodulating system. 8th April, 1957. (815680.)

12039. Railbourn, P.—Colour television reception. 12th April, 1957. (815681.)

15626. Bendix Aviation Corporation.—Underwater transducer. 16th May, 1957. (815873.)

16654. Weir, Ltd., G. & J.—Control equipment for steam turbines. 25th May, 1957. (815764.)

21380. Standard Telephones & Cables, Ltd.—Two-way radio terminal apparatus. 5th July, 1957. (815766.)

23743. Standard Telephones & Cables, Ltd.—Switching systems applicable particularly to automatic telephony. 26th July, 1957. (815767.)

23745. Standard Telephones & Cables, Ltd.—Magnetic core information storage matrices. 26th July, 1957. (815696.)

24559. Western Electric Co., Inc.—Barrier grid storage tubes. 2nd August, 1957. (815883.)

24981. Union Carbide Corporation.—Electrodes for arc melting refractory metals. 8th August, 1957. (815697.)

25388. Standard Telephones & Cables, Ltd.—Semiconductor devices and methods of manufacture. 12th August, 1957. (815699.)

30643. Allmänna Svenska Elektriska A.B.—Tiltable electric vacuum furnace. 1st October, 1957. (815705.)

33198. Standard Telephones & Cables, Ltd.—Carrier wave telegraphy. 24th October, 1957. (815708.)

36226. Sylvania Electric Products, Inc.—Production of electroluminescent layers. 16th January, 1956. (Divided out of 815720.) (815721.)

**1958**

1429. Philco Corporation.—Target structures for cathode-ray tubes. 15th January, 1958. (815967.)

4388. Standard Telephones & Cables, Ltd.—Mounting arrangements for electric equipment. 11th February, 1958. (815777.)

30724. Sylvania Electric Products, Inc.—Television receiver. 18th November, 1955. (Divided out of 815716.) (815717.)

31650. Amp, Inc.—Tools for crimping electrical connectors to electrical conductors. 26th March, 1957. (Divided out of 815581.) (815582.)

**1959**

1907. McMillan, E. B., and Redhoffer, R. M.—Dielectric walls for transmission of centimetric radiation. 7th September, 1955. (Divided out of 815575.) (815576.)

# CONTRACT INFORMATION

## Accepted Tenders and Prospective Electrical Work

### CONTRACTS OPEN

*Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses*

**Australia.**—Postmaster-General's Department, Melbourne. 3rd September. Insulation and resistance testing instruments. (E.S.B. 18968/59. Ten/41043.)* 24th September. Telephone mouthpieces and transmitter insets. (E.S.B. 18908/59. Ten/41044.)* 22nd September. Telephone receivers and parts. (E.S.B. 18830/59. Ten/41042.)*

Electricity Commission of New South Wales, Sydney. 28th September. Circuit-breakers, current transformers and air compressors. (E.S.B. 18629/59. Ten/41011.)*

State Electricity Commission of Victoria, Melbourne. 2nd December. One 60 MW turbo-generator set for Morwell power station. (E.S.B. 18440/59. Ten/40894.)* 10th September. Testing instruments for long line equipment. (E.S.B. 18913/59. Ten/41045.)*

**Bacup.**—Corporation. 16th September. Group "A" street lighting equipment. (See this issue.)

**Blackburn.**—Corporation. 9th September. Class "A" street lighting equipment. (See this issue.)

**Cambridge.**—Borough Council. 19th September. Electric lamps (Schedule No. 9), for the year commencing 1st October. City engineer and surveyor, The Guildhall.

**Cleethorpes.**—Corporation. 2nd September. Electrical installations in flats and houses. (See this issue.)

**Colwyn Bay.**—Corporation. Street lighting equipment. (See this issue.)

**Ellesmere Port.**—Corporation. 28th August. Street lighting equipment. (See this issue.)

**Formosa.**—Central Trust of China, Taipei. 4th September. 30,000 suspension insulators. (E.S.B. 18795/59/I.C.A. Ten/41014.)* Telephone installation equipment and cables. (E.S.B. 18792/59/I.C.A. Ten/41003.)*

**India.**—India Supply Mission. 27th October. Boilers, 10,000 kW turbo-alternator, crane, wagon tippler, diesel shunting locomotive, 6·9 kV and 440 V switchgear and cooling tower equipment. (See this issue.)

**Leeds.**—City Council. 3rd September. Runway lighting, wiring and ancillary works, together with the installation of switchgear and control equipment, at Leeds and Bradford Airport, Yeadon. City engineer, Civic Hall.

**Llandovery.**—Corporation. 4th September. Trunk road lighting equipment. (See this issue.)

**Manchester.**—Corporation. 28th September. Switchboard for waterworks. (See this issue.)

**Redcar.**—Borough Council. 28th August. Street lighting units. Borough engineer, Ridley House, Coatham Road.

**Rhodesia and Nyasaland.**—Federal Tender Board, Causeway. 28th August. 1,500 electric hand torches. (E.S.B. 19178/59. Ten/41146.)*

**South Africa.**—Stores Department, South African Railways, Johannesburg. 4th September. Switchboards. (E.S.B. 19043/59. Ten/41067.)*

**Stamford.**—Corporation. 9th September. Group "A" and "B" street lighting equipment. (See this issue.)

**Stockport.**—Borough Council. 7th September. Repair and renewal of the electrical installation at Reddish Baths, Gorton Road. Borough architect, Town Hall.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

**Sudan.**—Sudan Railways, Stores Department, Atbara. 10th September. One electrically heated cyanide salt bath furnace. (E.S.B. 18567/59. Ten/40915.)*

Director, Posts and Telegraphs, Khartoum. 5th October. One 100 kW radio transmitter. (E.S.B. 18711/59/I.C.A. Ten/41054.)*

**Surbiton.**—Borough Council. 4th September. Provision and erection of 33 group "B" lighting units in Town Planning Road No. 12. R. Thirlway, borough engineer, Council Offices, Ewell Road.

**Twickenham.**—Corporation. 2nd September. Group "A" street lighting equipment. (See this issue.)

**Warwickshire.**—County Council. Firms wishing to be placed upon a list of approved contractors for heating, hot and cold water supplies, electric light and power installations, etc., should apply by 7th September. (See this issue.)

**Wisbech.**—Corporation. 9th September. Street lighting equipment. (See this issue.)

### ORDERS PLACED

**Leeds.**—City Council. Accepted. Electrical work in connection with the erection of the Beeston Manor Aged Persons' Hostel (£2,081). Shaw, Dale & Co., Ltd.

**London.**—The British Transport Commission has placed orders valued at £290,000 for some 95 miles of electric cables and accessories of various types for the railway electrification programmes with the following:—British Insulated Callender's Cables, Ltd.; Pirelli-General Cable Works, Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Enfield Cables, Ltd.; Aberdare Cables, Ltd.; and Siemens Edison Swan, Ltd.

**Loughborough.** — Corporation. Recommended. Electrical equipment, including under floor heating, in the crematorium (£1,382). R. H. Murcott, Ltd.

**Manchester.**—Airport Committee. Recommended. Equipment for the new terminal building project at Manchester Airport:—H.v. switchgear.—Metropolitan-Vickers Electrical Co., Ltd. L.v. switchgear.—G. P. Dennis, Ltd. Power transformers.—Brush Electrical Engineering Co., Ltd. H.v. switchgear and up-rating of existing switchgear in Heghead substation.—South Wales Switchgear Co., Ltd.

**Plymouth.**—City Council. Recommended. Passenger lifts in the science block at the Plymouth and Devonport Technical College (£16,090). Otis Elevator Co., Ltd.

### WORK IN PROSPECT

*Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors*

**Bournemouth.**—Convalescent home and block of flats, West Cliff; H. Fairweather & Co., Ltd., Hyde Works, St. James Lane, London, N.10.

**Bradford.**—Development of 50-acre site, Holme Wood estate, for housing; W. H. Leathem, town clerk, Town Hall.

**Brandon.**—Ice cream factory for C. W. Gilbey, 23, Station Road, Ushaw Moor.

**Brigg.**—Boarding house for 50 girls and additional teaching accommodation at girls' high school (£20,000); county architect, Lindsey C.C., Lincoln.

**Carlisle.**—Houses (150) on the Morton estate for the City Council; L. J. A. Stow, city engineer, 18, Fisher Street, Carlisle.

**Colchester.**—Craft block for Royal Grammar School; Jesse Gowers, Ltd., 49, Park Road, Chelmsford.

**Colnbrook.** — Works extensions for Copperad, Ltd.; W. S. Try, Ltd., High Street, Cowley, Uxbridge.

**Doncaster.**—Old people's hostel on Cantley estate for T.C.; borough architect.

Bungalows (60) for T.C. (£58,000); Walter Firth, Ltd., Doncaster.

**Dorchester.**—Five additional classrooms and extensions to kitchen and dining room, County Modern School, for County E.C.; county architect, County Hall.

**Edinburgh.**—Houses (68) and 20 lock-up shops, Niddrie development; A. Steele, city architect, City Chambers, High Street.

**Fife.**—Houses (121), on four sites; R. S. Lawrie, county architect, County Buildings, Cupar.

**Great Yarmouth.**—Hostels for aged, blind and infirm persons, Magdalen College estate (£69,068), for T.C.; H. A. Holmes & Sons, Ltd., builders, South Ice House Hill, Gorleston.

**Hereford.**—Erection of new laundry at County Hospital; Birmingham Regional Hospital Board, 10, Augustus Road, Edgbaston.

**Hillingdon.**—Roman Catholic Church; T. G. Birchall-Scott, architect, 110, Horseferry Road, London, S.W.1.

**Jarrow-on-Tyne.**—Office block; Castle Structures, Ltd., 12, New Bridge Street, Newcastle-on-Tyne.

**Laverstock.**—St. Edmund's C. of E. Girls' Secondary School (£156,816); Wilts. county architect, County Hall, Trowbridge.

**Lichfield.**—Factory estate; John McLean & Sons, Ltd., Coven, Wolverhampton.

**Middlesbrough.**—Extensions to Constantine Technical College (£742,000); K. J. Caton, education architect.

Additions to St. Joseph's R.C. Primary School (£67,000); T. A. Crawford, architect, 80, Borough Road.

**North Shields.**—Box factory for Dryers, Ltd.; R. Frazer & Sons, contractors, Hebburn, Co. Durham.

**Nottingham.**—15-storey and 11-storey flats, Denman Street area; E. W. S. Martin, estates surveyor, Guildhall.

**Oldham.**—Departmental store for Littlewoods Mail Order Stores, Ltd., Liverpool; T. Partington, Ltd., Palm Buildings, Stocks Lane, Chadderton.

**Pershore.**—Pumping station for Pirton water supply; Delta Construction Co., Ltd., 54, Winchcombe Street, Cheltenham.

**Redditch.**—Factory; Precision Metal Wares, Ltd., 179, Belgrave Road, Birmingham, 12.

**Rotherham.**—Secondary school for St. Bernard's School; Weightman & Bullen, architects, 76, Rodney Street, Liverpool.

**Sidcup.**—General hospital (£2,500,000); South East Metropolitan Regional Hospital Board, 40, Eastbourne Terrace, W.2.

**Southampton.**—Erection of dormitory and other accommodation for the School of Navigation, University of Southampton (£218,000); Kirk & Kirk, Ltd., building contractors, Atlas Works, 287, Upper Richmond Road, London, S.W.15.

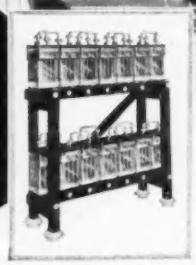
**Swansea.**—Eight-storey hotel for Trust Houses, Ltd., Kingsway; John Laing & Son, Ltd., Bunns Lane, London, N.W.7.

**West Bromwich.**—Church Hall, Charlemont Road; Cecil E. M. Fillmore, architect, Waterloo House, Birmingham.

Abattoir; Barretts & Baird, Ltd., Harvills Hawthorn.

**West Kesteven.**—Bungalows (32), in five parishes; J. R. Morgan, clerk to R.D.C., Sandon Close, Grantham.

# *Ready for the cue...*



*Double-tier stand holding a typical battery of 14 Tudor sealed-type cells as used with 'Safetylyte' emergency lighting equipment*

*'Safetylyte' Major charging and control cubicle*

A mains interruption is the cue for Tudor 'Safetylyte' to play the solo part. It springs automatically into action for instant take-over at split-second notice. The Tudor storage battery included can be kept fully charged for many years at negligible cost and needs little maintenance. Tudor 'Safetylyte' Emergency Lighting Equipment is available in compliance with all Home Office and County Council regulations. It offers complete emergency lighting protection in every type of public building both large and small.

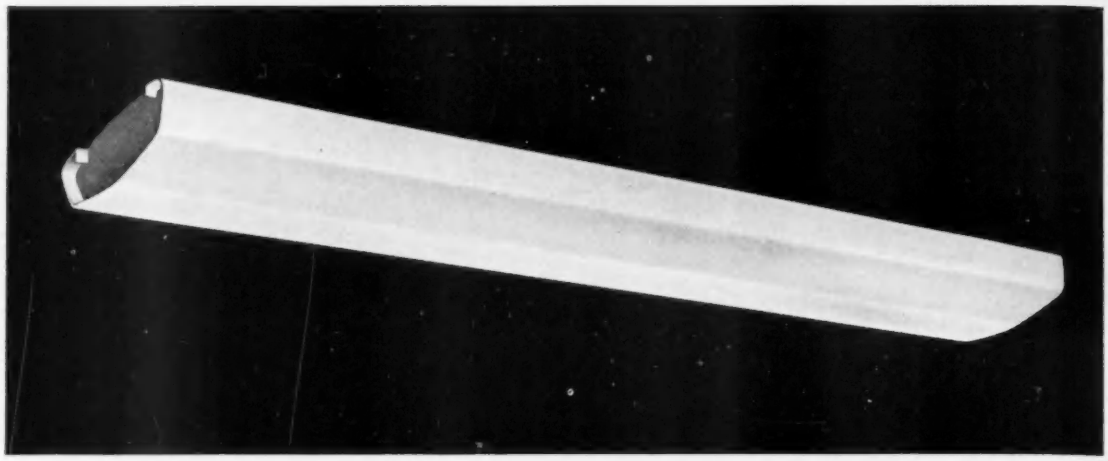
Tudor **SAFETYLYTE EMERGENCY LIGHTING**

**THE D.P. BATTERY CO. LIMITED, MANUFACTURERS OF KATHANODE AND TUDOR BATTERIES**

BAKEWELL, DERBYSHIRE · *Telephone*: BAKEWELL 581-5

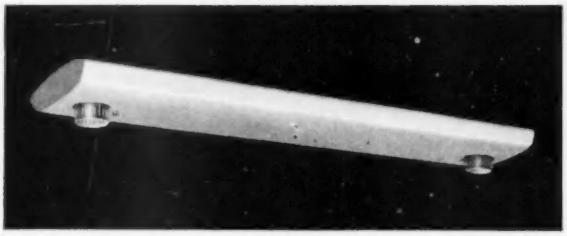
T172

# new—elegant—blended lighting

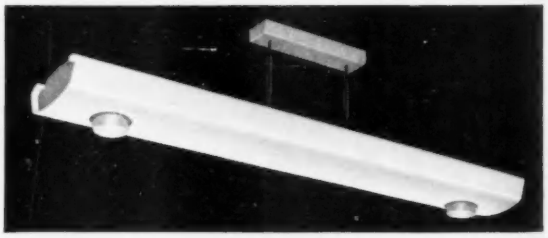


Designed for store, shop and office lighting the new Atlas KE/KI fittings offer fluorescent and a successful blending of tungsten and fluorescent lighting in fittings of extreme elegance. The delightful cross section appearance is a particularly pleasing feature. Wherever circumstances require that both fittings and lighting attain the highest standards of quality, Atlas KE/KI are an ideal choice.

**KEQ/2080/KE25** *clean, elegant design, with extruded opal 'Diakon' diffuser over rich red end panels. Spring-loaded bi-pin lampholders; quickstart control gear. Takes two 5 ft. 80w. tubes;* List Price £16-5-4 + £1-12-1 p. tax.



**KIQ 2080:** *combines fluorescent with two tungsten downlights for added sparkle. Opal 'Perspex' diffuser with black end panels. Houses two 5 ft. 80w. tubes, two 100w. filament lamps and quick-start gear.* List Price £23-4-6 + £2-15-8 p. tax



**KI 2040:** *a smaller version of KI 2080, supplied as a complete pack, using two 4 ft. 40w. tubes and employing two Atlas patented starter/ballast lamps in place of conventional lamps and gear. Opal 'Diakon' diffuser with metallic red end panels. Low initial cost makes it ideal for smaller shops and offices.* List Price £9-17-4 + £1-14-8 p. tax. Complete with tubes and ballast lamps.

# atlas ke and ki fluorescent fittings

ATLAS LIGHTING LIMITED, THORN HOUSE, UPPER ST. MARTIN'S LANE, LONDON, WC2

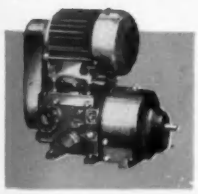
A subsidiary company of Thorn Electrical Industries Ltd.

# Carter Hydraulic Variable Speed Drives

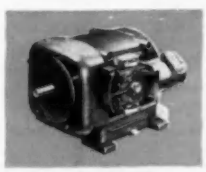
Wide infinitely variable speed range (approximately 27/1 on full load).
Sensitive accurate speed control by Hand, Electrical or Lever arrangements.
Constant output torque throughout the entire variable speed range.
Positive displacement action ensures maximum 'controllability' at all speeds.
Carter Variable Speed Gears may be used to pick up loads from zero r.p.m.
Controls may be operated with the drive either running or stationary.
Made in ten sizes for fractional up to thirty-five horsepower drives.
Flange mounted reduction gears can be supplied for slow speed drives.
Compact, efficient, easy to install and simple to maintain in service.
Entirely self lubricating since oil is the power transmitting medium.

*A comprehensive enquiry questionnaire is available which, when completed, will enable our Technical Staff to offer suggestions for the most suitable and economical Carter Variable Speed Drives.*
*To obtain copies of both Enquiry Forms and current technical publications please quote reference* 259.

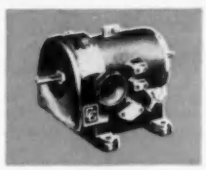
## typical drives



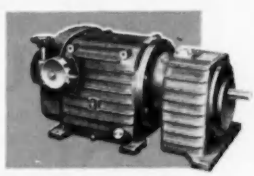
*'F' Type Carter Gear with top mounted motor and flange mounted spur reduction gear.*



*'A' Type Carter Gear with push-button operated Remote Electrical Speed Control.*



*Fractional horsepower 'F' Type Carter Gear fitted with standard Hand-wheel Speed Control.*



*Handwheel controlled 'A' Type Carter Gear with flange mounted spur reduction gear.*

**Carter Gears Limited**

BRADFORD 3
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*'phone: Bradford* 64378 (3 *lines*)
*'grams: 'Became' Bradford Telex*

# Wherever power is used Crofts Clutches play a vital role . . .

*CROFTS (ENGINEERS) LIMITED, Thornbury, Bradford 3, Yorkshire*

# Crofts Patented Stationary Field Magnetic Clutch

## *Its Advantages*

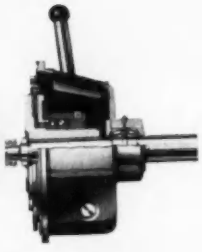
- ★ *Slip rings and brushes entirely eliminated.*
- ★ *Instantaneous response and rapid, shock-free pick-up to full load transmission.*
- ★ *Minimum field decay time and residual drag due to isolation of magnetic assembly.*
- ★ *Trouble-free operation with single point adjustment.*
- ★ *Negligible wear makes it ideal for frequent operation.*
- ★ *Compact and easily interchangeable with many existing units.*
- ★ *Drives in either direction of rotation.*
- ★ *No end thrust transmitted to shafts.*
- ★ *Wet or dry plate models suitable for gearbox installation, coupling two shafts, or for use with pulleys, sprockets, and gear wheels.*

*SEND FOR PUBLICATION 5923H*

*Some other Crofts Clutches*

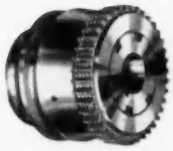
**Patent RO Disc Clutch**
Publication 5740H

**DS Rim Clutch**
Publication 154H

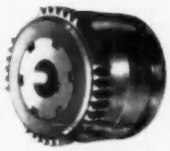


**Power Take-off**
Publication 5617H

**Automatic Centrifugal Clutch**
Publication 5722H



**BOM-L Multiple Disc Clutch**
Publication 855H



**Patent RM Multiple Disc Clutch**
Publication 5613H

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## CROFTS (ENGINEERS) LIMITED

**POWER TRANSMISSION ENGINEERS**

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*Tel.* 65251 (20 *lines*) *Grams : 'Crofters Bradford Telex'* *Telex* 51186

Makers of : Clutches, Conveyor drives, Couplings of all types, Double helical gear units, Fabricated steelwork, Geared motors, Hydraulic couplings, Iron, steel and non-ferrous castings, Machine-cut gears of all types, Motorised rollers, Patent Taper-Flushbushes, Plummer blocks, Shaft-mounted gear units, Special machinery drives, Spiral bevel gear units, Turbine gears, V-rope drives, Variable speed drives, Worm reduction gears.

*Branches at : Belfast Birmingham Bristol Cardiff Dublin Glasgow Ipswich Leeds Liverpool London Manchester Newcastle Northampton Nottingham Sheffield Stoke-on-Trent*

# LATEST PRODUCT

from EG

## "H" SERIES RELAY

**This is a smaller version of the well-known MK 11 Relay and is available from 3 amp. T.P. to 30 amp. S.P. contact rating. The unit is especially suitable where space is limited, the overall dimensions being $3\frac{3}{16}'' \times 3'' \times 2\frac{1}{4}''$.**

**Various types of mountings are available.**

**Plastic Coated Mercury Switch Contacts are provided ensuring silent and reliable operation requiring NO SERVICING.**

**THIS SIMPLIFIED RELAY IS THE MOST ECONOMICALLY PRICED FOR ITS RATING ON THE MARKET.**

*Other products include:*

COMPLETE CONTROL PANELS • PLUG-IN RELAYS • CONTACTORS FROM 15 TO 150 AMP • CONTACT THERMOMETERS • MERCURY SWITCHES • MINIATURE TELEPHONE RELAYS • MOTOR STARTER UNITS • MOTOR REVERSING UNITS • VOLTAGE AND CURRENT RELAYS.

### OUTSTANDING FEATURES –

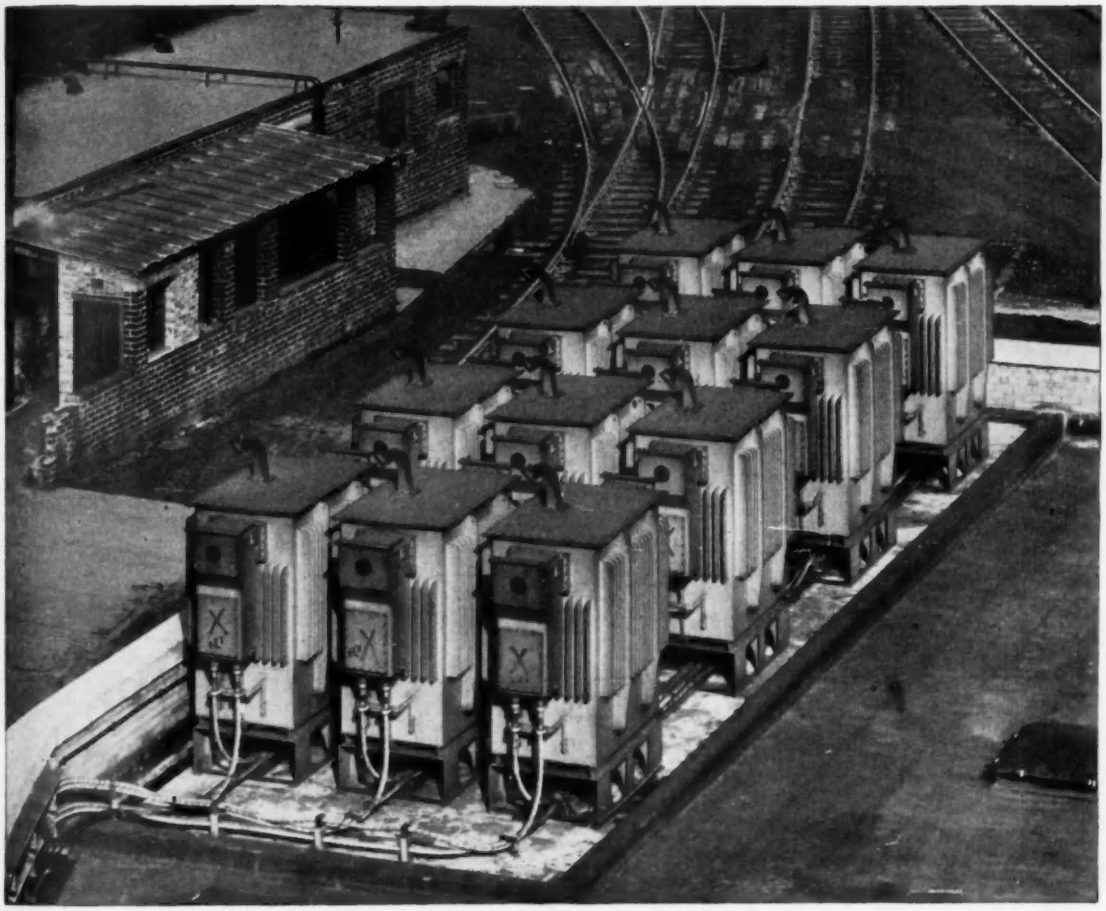
- ★ SMALL SIZE
- ★ SILENT OPERATION ON AC OR DC
- ★ LONG LIFE MERCURY CONTACTS
- ★ ECONOMICALLY PRICED

## ENGEL & GIBBS LTD

WARWICK RD · BOREHAM WOOD · HERTS · ELSTREE 2291 (5 lines)

**ELECTRICAL SWITCHGEAR MANUFACTURERS**

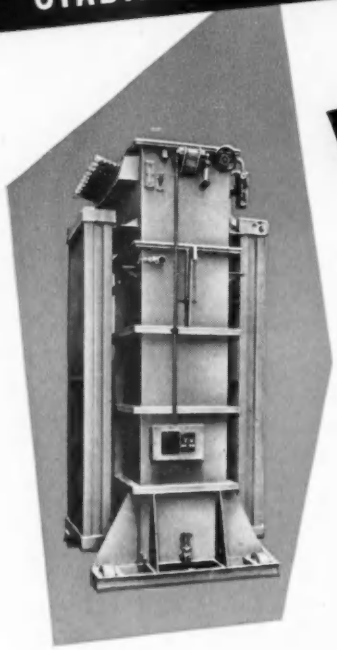
# J. & P. Capacitors for 80-ton arc melting furnace



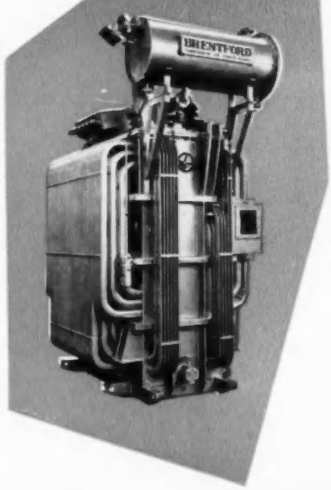
A 6 MVAr, 33 kV bank of J. & P. Capacitors is installed at the Parkhead Works of Messrs. William Beardmore & Co Ltd., to improve the power factor of their new 80-ton Arc Melting Furnace from approximately 0.82 lagging to 0.95 lagging. The bank consists of twelve tank type capacitors each 500 kVAr output, fully insulated for use on a 33 kV system, with the tanks earthed. The capacitors are installed on the roof of the substation, and are specially protected to withstand the corrosive atmosphere of a steel works.

**JOHNSON & PHILLIPS LTD · CHARLTON · LONDON · S.E.7**

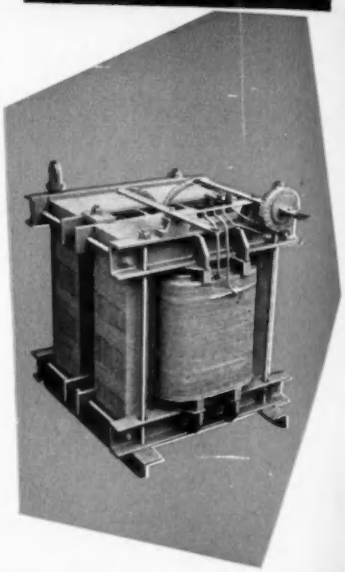
# STABILIZATION



# TRANSFORMATION




# REGULATION



Where a variable voltage is required, or where a fluctuating one must be stabilized, Brentford regulators provide stepless control—which can be entirely automatic. The largest units will handle 7.5 MVA of regulated capacity at transmission line voltages.

Brentford also make all types of distribution transformers up to 15 MVA at 33 kV—including those with Class 'B' or Class 'C' insulation and nitrogen cooling.

Brentford transductors provide an alternative method of voltage regulations where power factor and a certain amount of wave form distortion are unimportant.

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**BRENTFORD TRANSFORMERS LIMITED, MANOR ROYAL, CRAWLEY, SUSSEX. TEL: CRAWLEY 25121**

**AGENTS THROUGHOUT THE WORLD**

*Australia:* British General Electric Co., Pty., Ltd., G.P.O. Box 1594, Sydney, N.S.W.

*Belgium and Luxemburg:* Pierre Pollie, 13 rue de l'Abondance Brussels, 3.

*Canada:* Northern Electric Co. Ltd., P.O. Box 6123, Montreal, Quebec.

*Chile:* Kenrick-Imagri S.A.C., Casilla 1704, Santiago.

*France:* Prome, 5 rue General de Castelnau, Paris 15.

*Holland:* Ingenieursbureau Kempff, Sinjeur Semijnsweg 165, 'S-Gravenhage.

*Hong Kong and China:* Harvey Main & Co. Ltd., P.O. Box 268, Hongkong.

*India:* Kaycee Industries Ltd., Kamani Chambers, Ballard Estate, Bombay.

*Iraq:* Diesel Trading Co. Ltd., Mirjan Building, South Gate, Baghdad.

*Israel:* Consolidated Near East Co. Ltd., 2 Victoria Street, London, S.W.1.

*Kuwait:* Yusuf A. Alghanim, P.O. Box 223, Kuwait.

*Malaya and Singapore:* South Engineers Ltd., P.O.B. 425, Kuala Lumpur.

*Norway:* Elektrosalg, Møllerveien 4, Oslo.

*New Zealand:* Modern Equipment Ltd., P.O. Box 468, Christchurch.

*Pakistan:* Philips Electrical Co. of Pakistan Ltd., P.O. Box 7101, Karachi 3.

*Rhodesia and Central Africa:* W. L. Kerr (Pvt) Ltd., P.O. Box 834, Salisbury, S. Rhodesia.

*South Africa:* G. H. Langler & Co. Ltd., P.O. Box 3762, Johannesburg.

*Turkey:* KanuKollektif Sirketi, Galata, Sair Ziya Pasa Cad 70, Hani Kat 1, Istanbul.

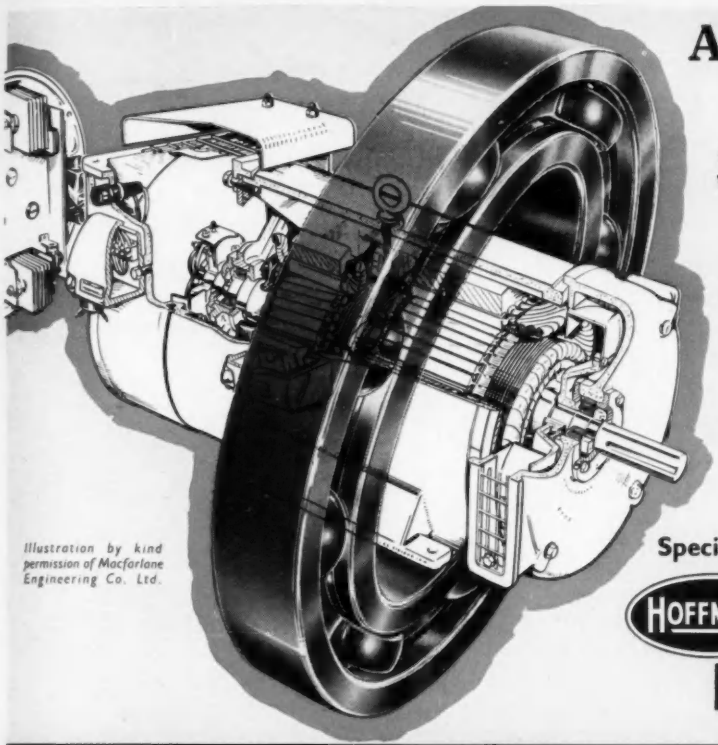

*Illustration by kind permission of Macfarlane Engineering Co. Ltd.*

# ANOTHER LINKED SUCCESS

Again Hoffmann have assisted in yet another success—this brushless alternator manufactured by the Macfarlane Engineering Co. Ltd., is the very first of its type in the country, and is fitted with Hoffmann bearings.

Being brushless this machine has eliminated the usual copper and carbon dust associated with brushes; also, moving parts have been reduced to the combined rotor in its bearings—Hoffmann, which will reduce frictional drag to the very minimum.

**Specify Hoffmann the designer's choice**

HOFFMANN **BALL & ROLLER BEARINGS**

THE HOFFMANN MANUFACTURING COMPANY LIMITED CHELMSFORD ESSEX.

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# Field & Grant LIMITED

**ELECTRICAL AND REMOTE CONTROL EQUIPMENT**

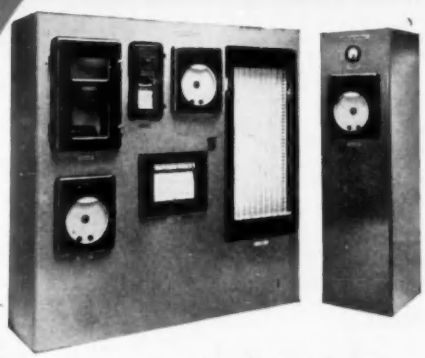

*Illustration by courtesy of Huntington, Heberlein & Co., Ltd.*

***Tailor made to YOUR specification or engineered and designed for YOU***

★ LET OUR ENGINEERS HELP TO SOLVE YOUR CONTROL PROBLEMS

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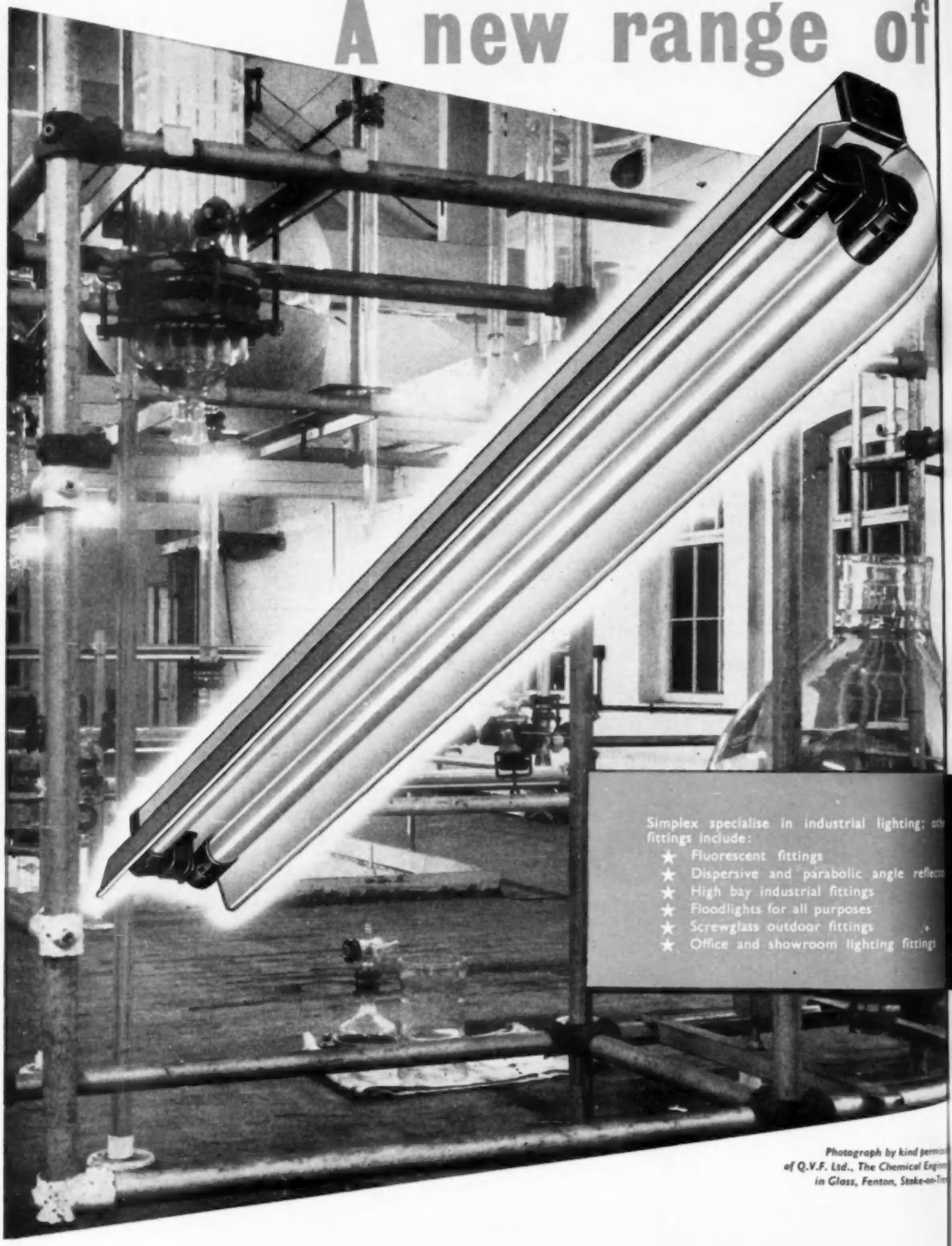
*The mark of the Specialists*

# A new range of



Simplex specialise in industrial lighting; oth
fittings include:

- ★ Fluorescent fittings
- ★ Dispersive and parabolic angle reflecto
- ★ High bay industrial fittings
- ★ Floodlights for all purposes
- ★ Screwglass outdoor fittings
- ★ Office and showroom lighting fittings

*Photograph by kind permis*
*of Q.V.F. Ltd., The Chemical Engin*
*in Glass, Fenton, Stoke-on-Tre*

# Simplex (ECONOMICALLY PRICED)

# A·C·F Fittings

## FOR EVERY INDUSTRIAL ATMOSPHERE

This new range of A·C·F —anti corrosion fluorescent—fittings is the outcome of Simplex research into the concerning needs of industry—in particular prevention of waste by corrosion.

Already outstandingly successful, the Simplex A C F fittings range has been extended to provide:

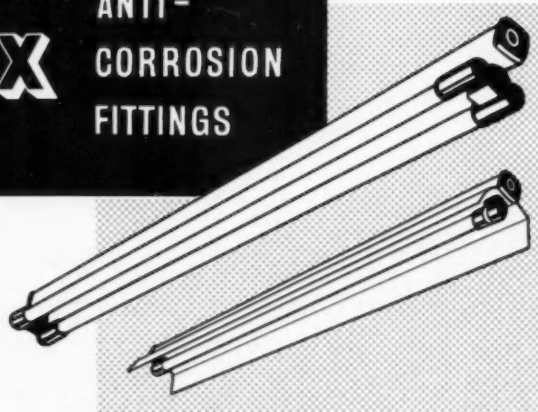
- ★ Single and twin types for 5 ft. 80W., 4 ft. 40W., 2 ft. 20W Tubes
- ★ An improved lampholder to seal the interior against entry of corrosive agents.
- ★ Complete protection of channel interior by Simplex patented method of P.V.C. covering.
- ★ Bi-pin lampholders—Simplex patented —which if required can be rotated for reflector type tubes.
- ★ A lampholder assembly that doesn't have to be removed to fit tubes.

Simplex A C F fittings are rapid-start, and a free replacement will be made under a 3 year guarantee against electrical failure.

Prices range from £7 19 0d. Send or 'phone for full descriptive leaflet.

Simplex provide the right fittings for the job—and, on request, a non-obligatory technical sales service to survey and prepare lighting schemes to help you obtain maximum results.

**Simplex** ANTI-CORROSION FITTINGS



**SIMPLEX ELECTRIC COMPANY LIMITED**
**BLYTHE BRIDGE · STAFFS**

Branches throughout Britain
and Agents throughout the World.

A T. COMPANY

*'Tis distance lends enchantment to the view,*
*And robes the mountain in its azure hue.*

*(Pleasures of Hope by Thomas Campbell)*

*By courtesy of Tourist Information Centre, Belfast*

Irish cables are manufactured amidst scenery depicted above, showing the famous and beautiful Mourne Mountains

**IRISH CABLES** will stand inspection right through to the very core, as a result of the high quality of materials used and constant vigilance and inspection throughout manufacture

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DUNMURRY · Northern Ireland
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London Office:
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LONDON, W.1
Telephone: LANgham 8317/9

LOW VOLTAGE A.C.

# AIR CIRCUIT BREAKERS

**ASTA TESTED TO BSS 116-1952 for 26/31 MVA 415v.**

*Types available —*

- **Fixed type for either back or front of panel mounting**
- **Horizontal draw-out** *(as illustrated)*
- **Metal enclosed**
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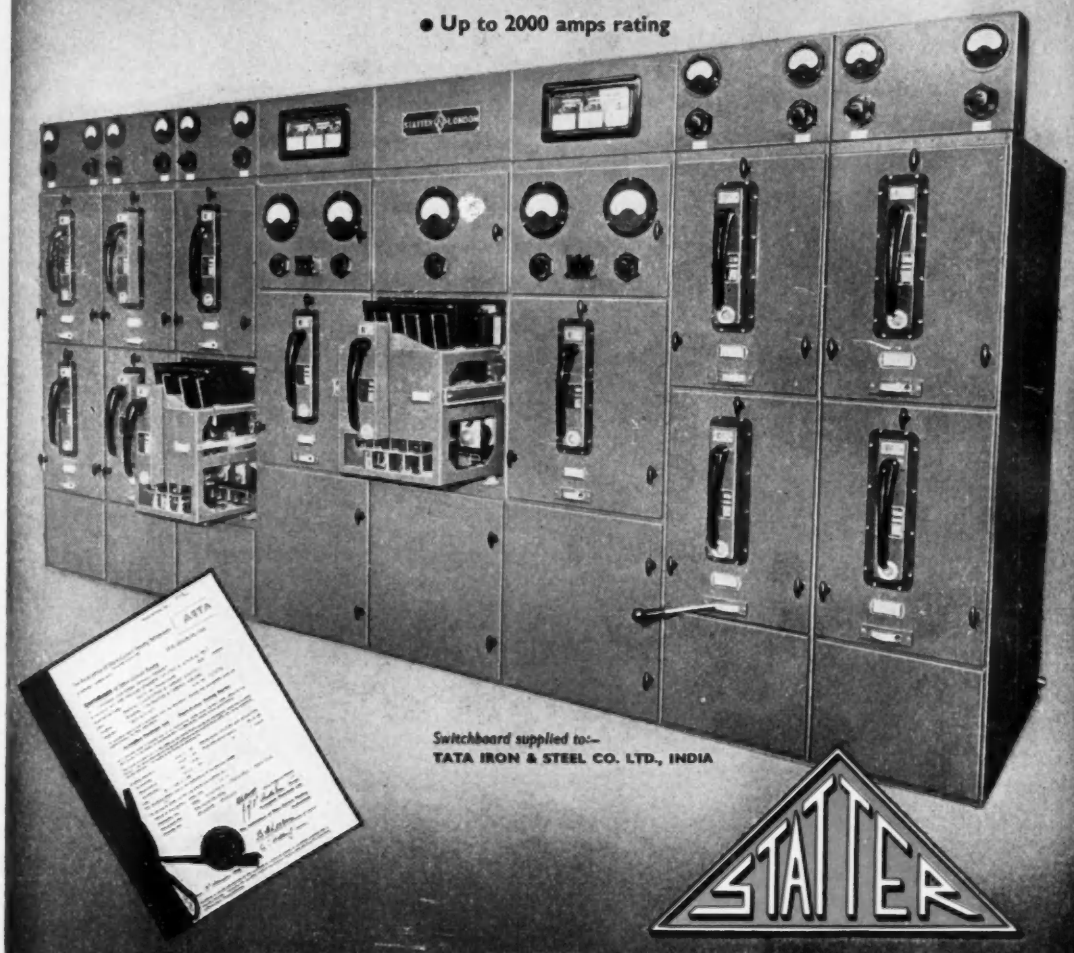

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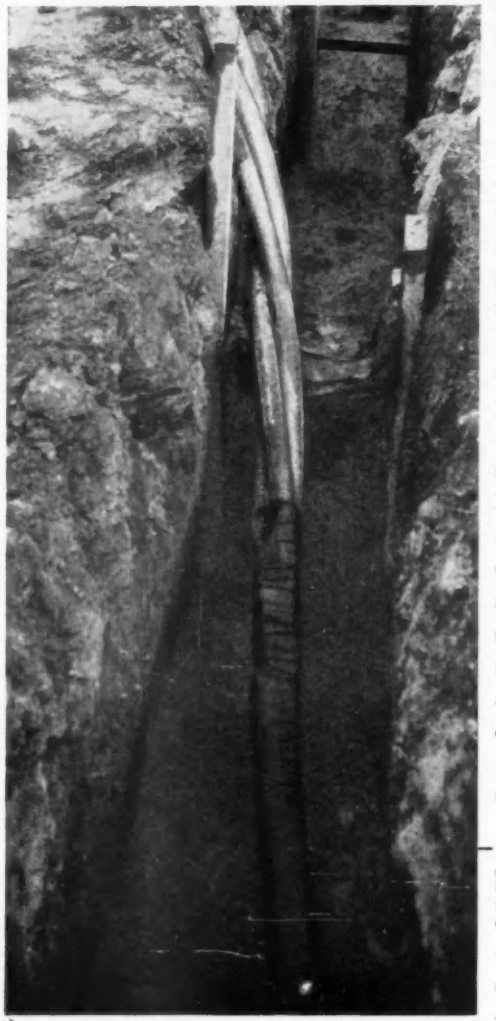

*Cable is easily fed into shallow trench. Neoprene covering protects lead sheath of cable from corrosion.*

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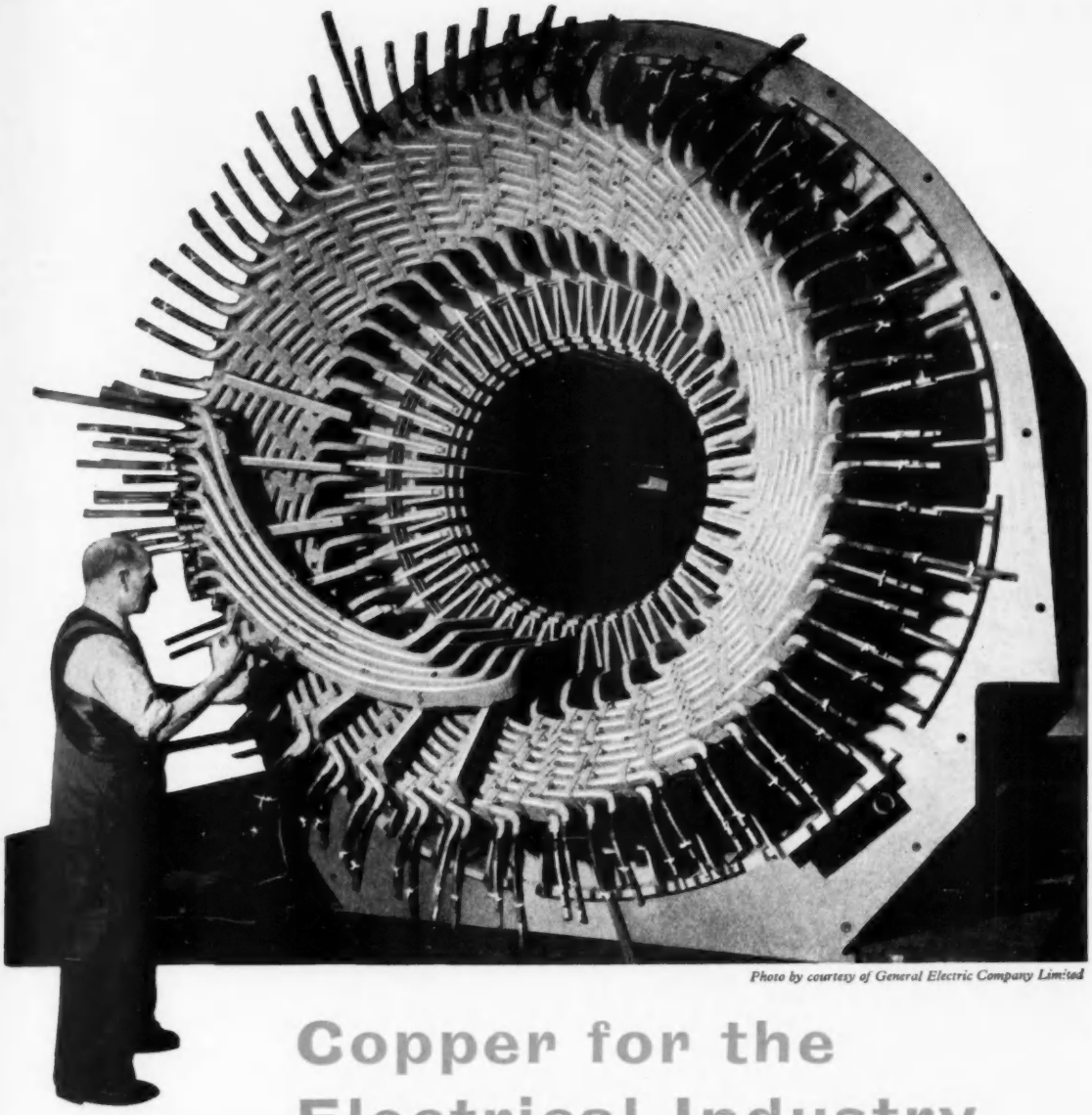

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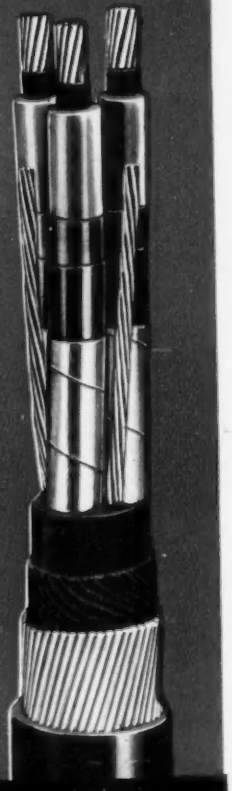

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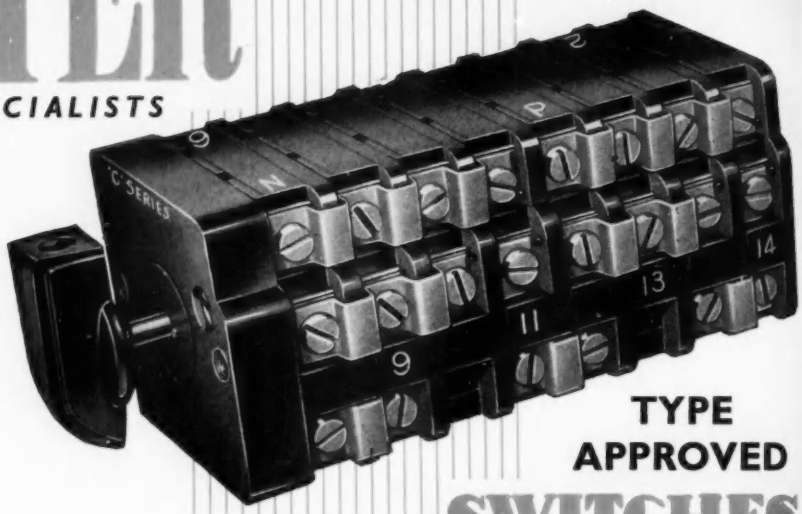


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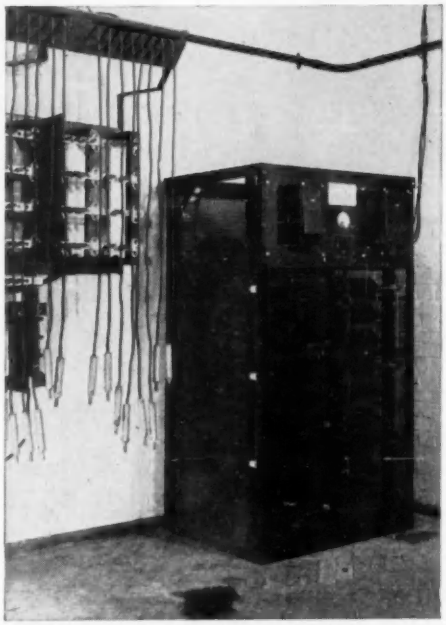
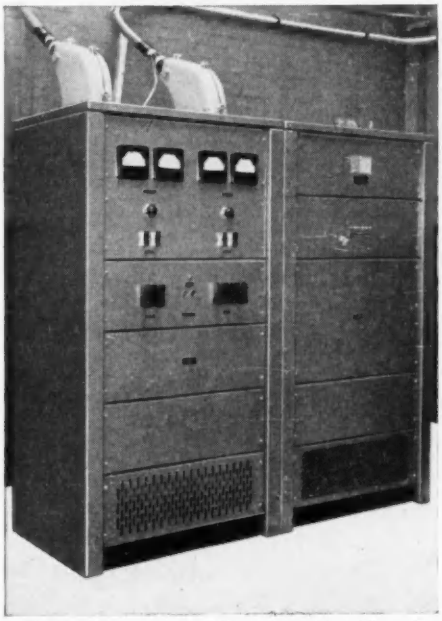


**1931** *A copper-oxide battery charging equipment installed at Oxford University for supplying a 15A charging current to a 100 cell battery.*



**1959** *A germanium rectifier equipment providing a d.c. output of 150kW (300A at 250-0-250V) at Advance Laundries, London, installed by the South Eastern Electricity Board in the course of d.c. to a.c. (415V 3-phase) change-over.*

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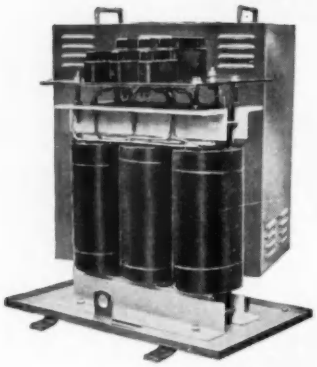

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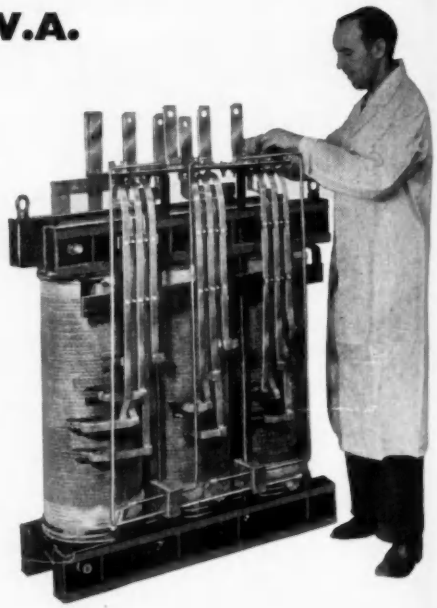

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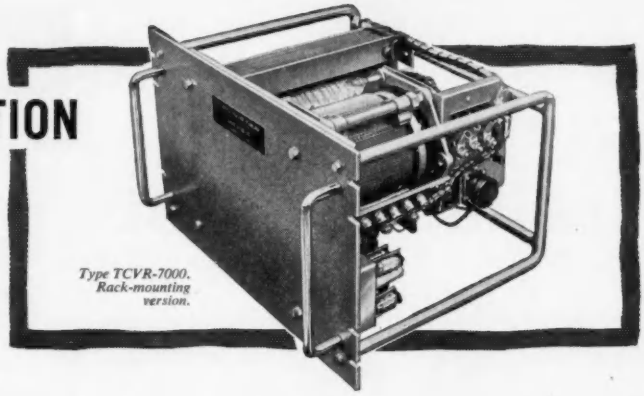

*Type TCVR-7000. Rack-mounting version.*

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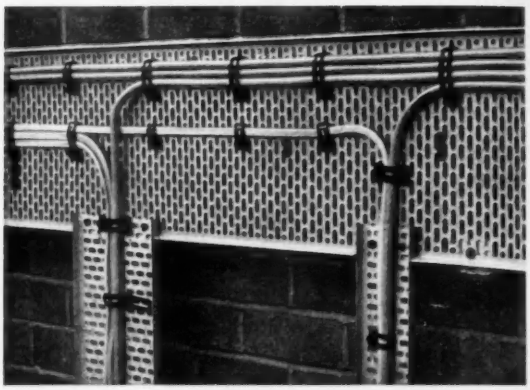

Illustration shows a portion of a typical SAS Saddle installation.

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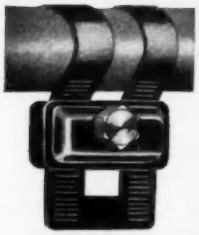

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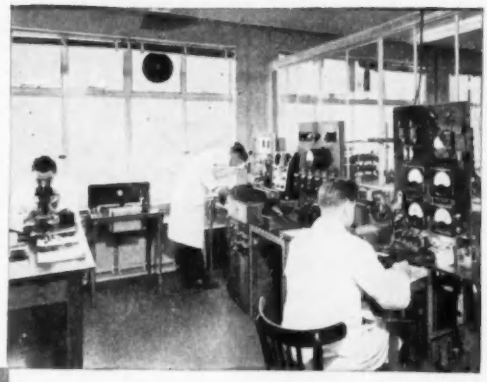

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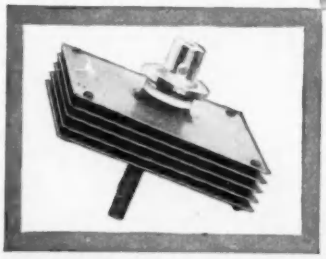

*Illustrations :*
*Top. Machine for pulling crystals from the melt.*
*Centre. Electrical measurements and testing room.*
*Bottom. The Hewittic air cooled germanium diode.*

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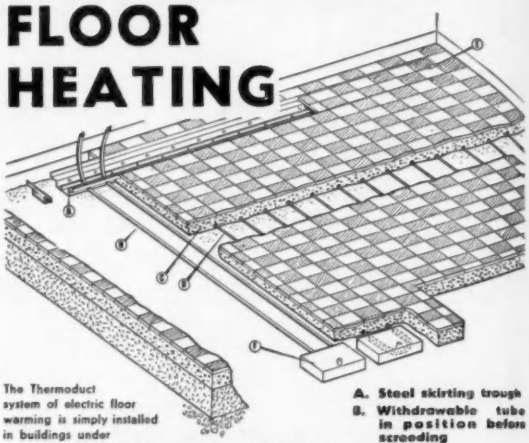

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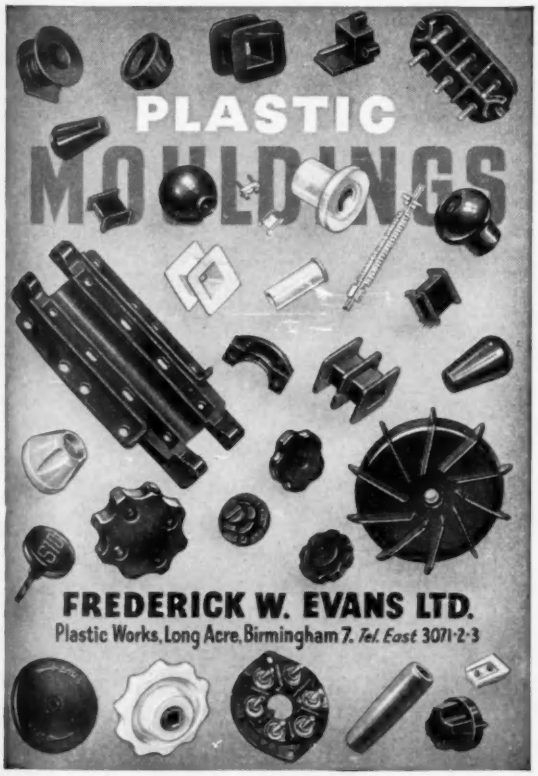

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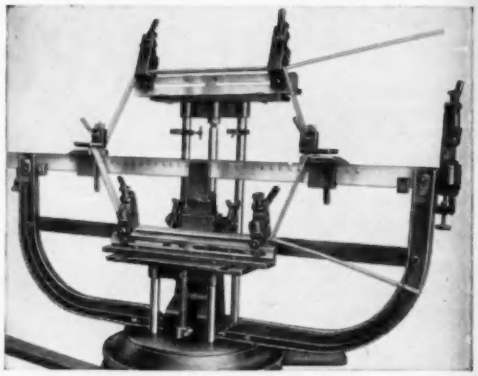

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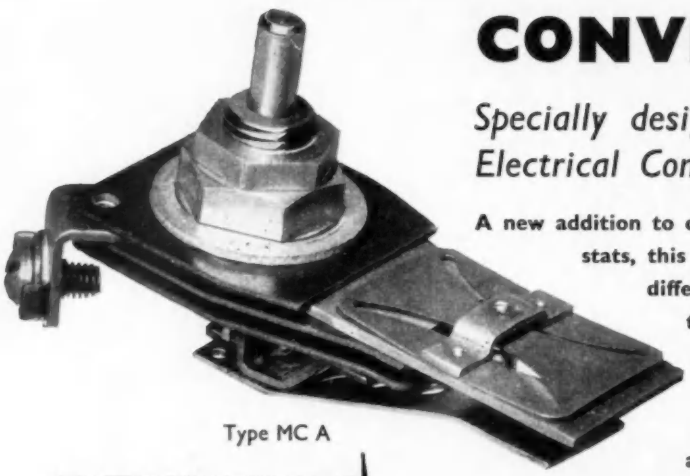

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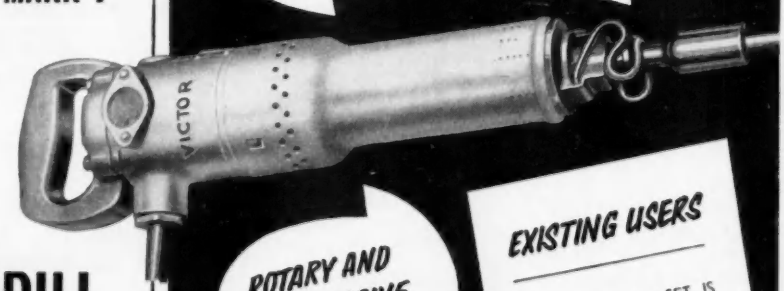


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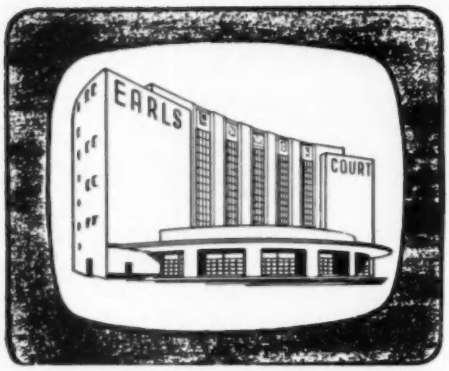


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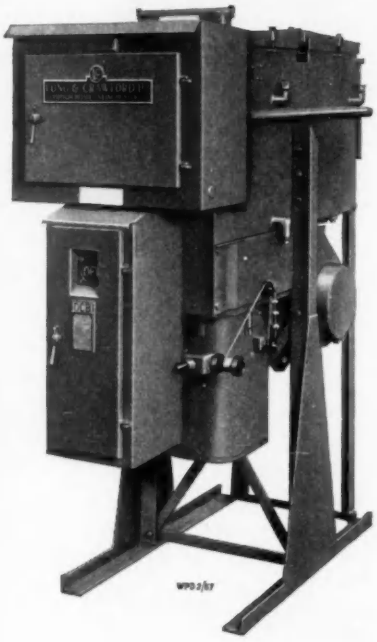

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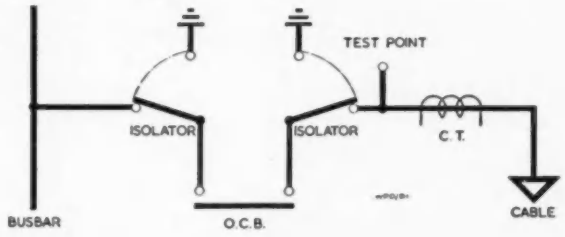


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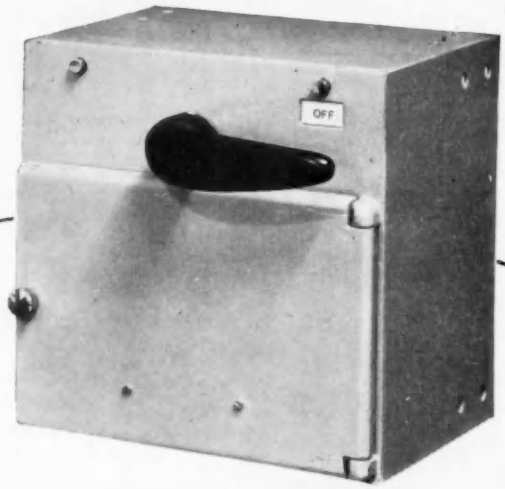


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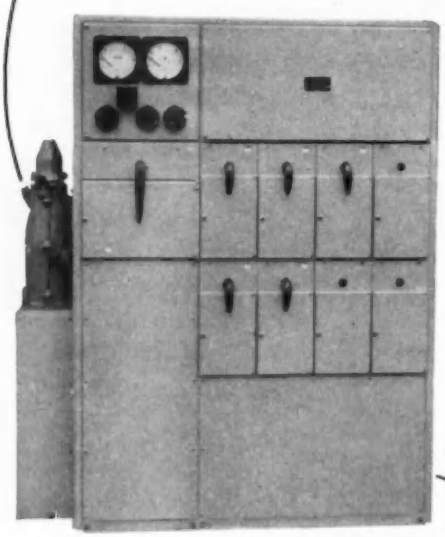

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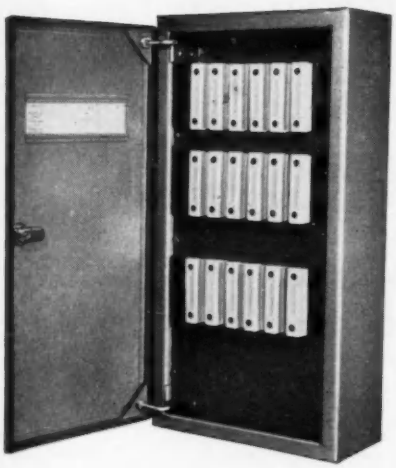

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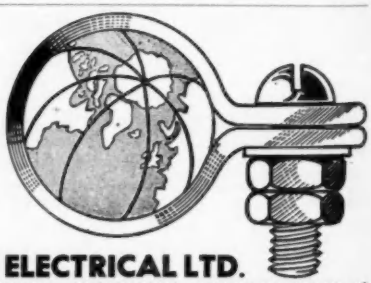

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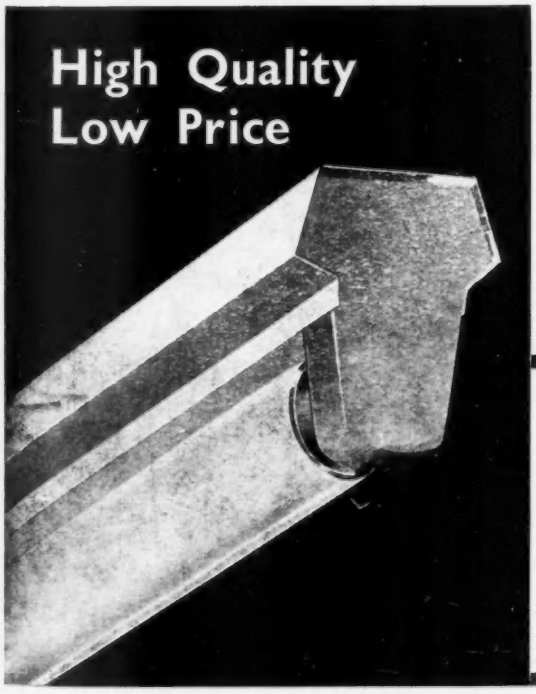


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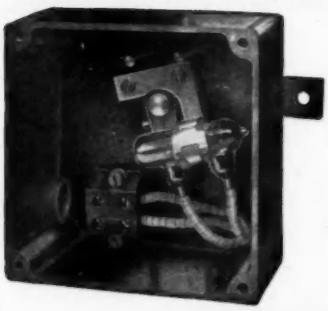

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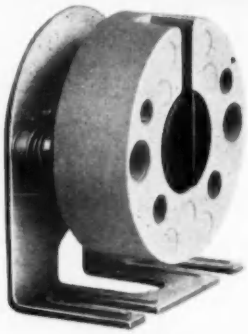

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- *Shelves adjustable every inch*
- *Heavygaugeshelves will carry 400 lbs. each*
- *Stove enamelled bronze green*
- *6 shelves per bay—Extra shelves 8/- each*
- *Quantity discounts*

**DELIVERED FREE**
**£3.15.0**
**Ready for Erection**

**N. C. BROWN LTD.**
**Rochdale Road Works**
**HEYWOOD · LANCS**
*—the manufacturers!*

ALL OTHER SIZES available at equally keen prices.

Telephone:
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(6 lines)

# UNIT CONSTRUCTION + INTERCHANGEABILITY = FLEXIBLE EXTENSIBILITY

## INDOOR AND OUTDOOR RANGES FROM 415 TO 22,000 VOLTS

**I.V.I.**
**metal clad switchgear**

## THE SUM TOTAL OF EFFICIENCY

The unique design of I.V.I. metal-clad switchgear provides an unequalled facility for the development of distribution networks. Oil circuit breakers, fault making oil switches and automatic fused switches can be plugged into the standard busbar/cable stationary portion. This feature is readily appreciated by both Planning and Operating Engineers.

**Your Symbol of reliability**

## YORKSHIRE SWITCHGEAR

**AND ENGINEERING COMPANY LTD.**

MEANWOOD, LEEDS 6
Tel.: Leeds 57121/5

*Yorkshire Switchgear are experienced in engineering whole projects from the electrical aspect and welcome initial inquiries*

# More than equal to the extra service demanded

PIRELLI-GENERAL

CABLES

ORDER FROM THE G.E.C.

The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2

# Classified Advertisements

**CLASSIFIED** advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

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**SERIES DISCOUNTS** for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

**SITUATIONS WANTED**:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

**REPLIES TO BOX NUMBERS** should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

**Advertisements are accepted up to first post on Monday of the week of issue**

**If displayed with boxed rules, name or symbol block by Friday prior to week of issue**

**All communications to be addressed to:**
**Classified Advertisement Department,**
**ELECTRICAL REVIEW**
**Dorset House, Stamford Street**
**London, S.E.1**

**Original testimonials should not be sent with applications for employment**

## OFFICIAL NOTICES, TENDERS, ETC.

### BOROUGH OF CLEETHORPES

**Trinity Road Housing Scheme:**
**Site 8E, Parts 1 & 2**

ELECTRICAL INSTALLATIONS

TENDERS are invited from Electrical Contractors for the complete wiring installation for the following dwellings :—

HOUSING SITE No. 8E.
Forty-eight Single Bedroom Flats in Three Blocks of Sixteen.

HOUSING SITE No. 8E, Part 2.
Twenty-eight Type "K" Modified Houses in Pairs at Thoresby Place and Gunby Place.

The work will be carried out under a sub-contract to the main building contracts.

Forms of tender, conditions of contract, specifications and all relevant information may be obtained from A. B. Cooper, A.M.I.C.E., Borough Engineer, Council House, Cleethorpes, where drawings may be inspected.

Applications for particulars must be accompanied by a deposit cheque of Two Guineas, made payable to the Cleethorpes Corporation, which will be returned upon receipt of a bona fide tender.

Tenders in official sealed envelopes must reach the undersigned not later than noon on Wednesday, 2nd September, 1959.

The Council do not bind themselves to accept the lowest or any tender.

G. SUTCLIFFE,
Town Clerk.
Council House,
Cleethorpes.
29th July, 1959. 1258

### BOROUGH OF TWICKENHAM

**Street Lighting Improvement, Stage III, Group "A" Lighting**

TENDERS are invited for the provision and erection of 127 Street Lighting Units comprising Lanterns and Auxiliary Gear for Sodium, Colour Corrected Mercury Fluorescent and Fluorescent Lamps on reinforced concrete columns and existing trolley-bus poles.

Drawings may be inspected and the specification, bills of quantities and form of tender obtained on application to Mr. A. S. Knolles, B.Sc., Borough Engineer, Municipal Offices, Twickenham, on payment of a deposit of £2 2s., returnable only on receipt of a bona fide tender not subsequently withdrawn.

Sealed tenders in the official envelope provided endorsed "Public Street Lighting" must be delivered to the undersigned not later than 10 a.m. on Wednesday, the 2nd September, 1959.

The Council do not bind themselves to accept the lowest or any tender.

W. H. JONES,
Town Clerk.
Municipal Offices,
Twickenham. 1210

### MANCHESTER CORPORATION WATERWORKS

**Contract HEH/2**

TENDERS are invited for the manufacture, supply and delivery at Godley, near Hyde, Cheshire, of one Switchboard, etc.

Tender forms (returnable by 28th September), specification, conditions of contract, etc., from the Secretary, Waterworks Offices, Town Hall, Manchester, 2, on payment of One Guinea deposit, to be refunded on receipt of a bona fide tender. 1054

M

### WARWICKSHIRE COUNTY COUNCIL

**To Heating and Electrical Engineers**

FIRMS desirous of having their names placed upon a list of approved contractors from whom the Warwickshire County Council will invite tenders for schemes costing £1,250 and over for :—

1. Heating, hot and cold water supplies, gas and steam services; and/or
2. Electric light and power installations;

should make application on or before Monday, the 7th September, 1959, to G. R. Barnsley, F.R.I.B.A., County Architect, Shire Hall, Warwick.

When submitting their applications, applicants must clearly indicate the maximum financial amount of individual contracts for which they wish to be considered and must forward particulars of contracts recently executed by them, giving the names and addresses of local authorities or persons to whom reference can be made.

Tenders will be considered only from firms included in the official list which will be compiled by the appropriate committee after consideration of applications.

Contractors whose names are already included on the Council's approved list need not make application.

L. EDGAR STEPHENS,
Clerk of the Council.
Shire Hall,
Warwick. 1226

### STATE ELECTRICITY COMMISSION OF VICTORIA

**22-32, William Street, Melbourne, C.1**

**One 60-MW Turbo-Generator Set and Associated Plant, Morwell Project**

THE Commission is inviting tenders for the design, manufacture, supply, delivery, erection and maintenance of :—

One 60-MW Steam Turbo-Generator, complete with Condensing, Feed-water Heating, Water Storage and Circulating Water Plant and Accessories, all in accordance with the terms and provisions of Specification No. 59-60/2 and B.6 Contract Conditions.

Copies are available from the Agent-General for Victoria, Victoria House, Melbourne Place, Strand, London, W.C.2, and also from the Commission Offices, 22, William Street, Melbourne, Australia.

The charge for specification is £3 (returnable) for 3 sets of tender documents. Extra copies £1 (not returnable) per set.

Tenders, endorsed "Tender to Specification No. 59-60/2," are returnable in the Tender Box, Ground Floor, 22, William Street, Melbourne, by 11 a.m. on the 2nd December, 1959.

The Commission does not bind itself to accept the lowest or any tender. 1100

### BOROUGH OF EALING

**Street Lighting, Group "A," Western Avenue**

1. Supply of 23 140-watt Sodium, 57 400-watt Mercury and 66 400-watt Mercury Fluorescent Lanterns and Equipment.
2. Supply and erection of 119 Steel Columns, 25 ft. mounting heights.

Details obtainable from Borough Engineer, Town Hall, Ealing, London, W.5, on payment of £5 for each tender, returnable on receipt of a bona fide tender.

Tenders to Town Clerk, Town Hall, Ealing, London, W.5, by noon 31st August, 1959. 1116

### THE OFFICE OF INDIA SUPPLY MISSION

**2536, Massachusetts Avenue, N.W. Washington 8, D.C., U.S.A.**

invites tenders for the following :—

| Item. | Description. | Specification No. |
|---|---|---|
| 1. | Water tube boilers, 80,000 lb./hr. | CH-2 |
| 2. | Steam turbo-alternator, 10,000kW | CH-3 |
| 3. | Overhead turbine-house crane | CH-4 |
| 4. | Broad gauge side wagon tippler | CH-5 |
| 5. | Shunting diesel locomotives | CH-6 |
| 6. | 6.9-kV and 440-v. switchgear and accessories | CH-7 |
| 7. | Cooling tower equipment | CH-8 |

Tender forms and specifications relative to the above can be obtained from Co-ordination Branch, India Store Department, Bromyard Avenue, Acton, London, W.3, at a cost of 14 shillings and 3 pence for conditions of contract and tender form, plus £1 15s. 8d. per set of specifications for each item which is not refundable. Tenders are to be returned direct to India Supply Mission, Washington, U.S.A., so as to reach them by the 27th October, 1959.

Specimen copy of the above enquiry can be seen at Engineering Branch, India Store Department, Bromyard Avenue, Acton, London, W.3, under reference No. S.3297/59/ENG.2. 1255

### CITY OF WINCHESTER

**Street Lighting**

**Winchester-Preston Trunk Road (A.34), St. Cross Road and Andover Road**

TENDERS are invited for the supply and erection complete of 83 Lighting Points, involving eighty-one 25-ft. Steel Columns and 2 Wall Brackets with 250-watt Colour-corrected Mercury Lamps.

Specification, bill of quantities and form of tender may be obtained from the City Engineer and Surveyor, Guildhall, Winchester, at whose office plans can be inspected.

A deposit of two guineas will be required, but will be refunded on receipt of a bona fide tender.

Tenders, in the envelope provided, endorsed "St. Cross Road and Andover Road Lighting," should be addressed to the undersigned not later than first post on FRIDAY, 11th September, 1959.

R. H. McCALL,
Town Clerk.
Guildhall, Winchester.
7th August, 1959. 1183

### COUNTY BOROUGH OF BLACKBURN

**Street Lighting Materials, Class A**

TENDERS are invited for the supply of the whole or part of the following :—

136 Concrete Columns, sundry cables.
147 Lanterns for 400-w. M.B.F.U., 147 ballast and 71 controllers.

Specifications and tender envelopes obtainable from the Borough Engineer, Town Hall, Blackburn. Tenders to be returned to the undersigned by 9th September.

FRANK SQUIRES,
Town Clerk. 1272

*Official Notices (continued)*

## BOROUGH OF LLANDOVERY

**Provision of Improved Street Lighting on the Trunk Roads A.40, A.483**

TENDERS are invited from experienced contractors for the provision of 31 Lanterns suitable for Sodium Discharge Lamps, 21 Steel Columns and 10 Brackets to be fitted to existing poles, and the erection of steel columns and fixing and wiring of lanterns and all auxiliary gear on the steel columns.

Drawings may be inspected at, and specifications, bills of quantities and forms of tender may be obtained from, W. Davies, Borough Surveyor, Assembly Rooms, Llandovery, on payment of two guineas deposit, which will be refunded on receipt of a bona fide tender.

Tenders to be returned in a plain envelope marked "Trunk Road Lighting Tenders" to the undersigned not later than first post on Friday, 4th September, 1959.

The Council does not bind itself to accept the lowest or any tender it may receive.

VAUGHAN M. WILLIAMS,
Town Clerk.

Town Clerk's Office,
Assembly Rooms, Llandovery. 1209

## BOROUGH OF ELLESMERE PORT

**Contract No. 279**

**Proposed Street Lighting, Stanney Lane**

TENDERS are invited for the provision and erection of 47 Group "A" Street Lighting Columns, taking down 18 Group "B" Columns and re-erecting same throughout the Borough.

Contract documents obtainable from the Borough Engineer and Surveyor, Queen Street, Ellesmere Port.

Sealed tenders, in the plain official envelope provided, must reach the undersigned by not later than 5 p.m. on Friday, the 28th August, 1959. The Council do not bind themselves to accept the lowest or any tender.

R. J. BERNIE,
Town Clerk.

Municipal Offices,
Ellesmere Port, Cheshire. 1224

## BOROUGH OF STAMFORD

**Street Lighting**

TENDERS are invited for installing 5 Steel and 82 Concrete Columns for Groups "A" and "B" Street Lighting in various streets within the Borough.

Specification and form of tender may be obtained on application to the Borough Surveyor, Town Hall, Stamford, Lincs., upon payment of a deposit of £2 2s., which is returnable on receipt of a bona fide tender. Tenders in plain sealed envelopes, endorsed "Tender for Street Lighting," should reach the undersigned not later than 10 a.m., Wednesday, 9th September, 1959.

The Council do not bind themselves to accept the lowest or any tender.

H. BEDFORD,
Town Clerk.

Town Hall,
Stamford, Lincs.
14th August, 1959. 1277

## BOROUGH OF BACUP

**Street Lighting Equipment, Main Roads**

TENDERS are invited for the supply, delivery and erection of Street Lighting Equipment on Burnley Road (A.671) and New Line (A.6066), approximate lengths 1¾ and 1¼ miles respectively. Specifications, together with forms of tender, may be obtained from me on payment of a deposit of £2 2s., returnable on receipt of a bona fide tender not subsequently withdrawn.

Tenders, in plain sealed envelopes, endorsed "Street Lighting Equipment," to be delivered to me by 16th September, 1959.

The Council do not bind themselves to accept the lowest or any tender.

A. D. BOND,
Town Clerk.

Town Clerk's Office,
Stubbylee Hall, Bacup. 1278

CLASSIFIED ADVERTISEMENTS ARE PREPAID

## BOROUGH OF WISBECH

**Street Lighting Programme, 1959**

TENDERS are invited for the supply of approximately 390 Pre-cast Reinforced Concrete Lighting Columns, 20 Steel Columns, 50 Extension Brackets, 110 Wall Brackets, together with 530 Lanterns for Mercury Discharge Lamps and Tungsten Lamps.

The specification and form of tender may be obtained from the Borough Engineer, Church Terrace, Wisbech.

Sealed tenders, in the envelopes provided, must be delivered to the undersigned not later than Wednesday, 9th September, 1959.

The Council does not bind itself to accept the lowest or any tender.

N. E. DEWICK,
Town Clerk.

Town Hall,
Wisbech, Cambs.
August, 1959. 1279

## BOROUGH OF COLWYN BAY

**Street Lighting**

PREPARATION of a lighting scheme for the urban parts of the Borough is in hand. The scheme will be mainly Group "B," but with some Group "A." The work is to be carried out in sections.

Manufacturers of lamps, columns and time switches suitable for incorporation in such a scheme are invited to send particulars to Mr. H. Wilman, A.M.I.C.E., M.I.Mun.E., Borough Engineer and Surveyor, Whalley Range, Lansdowne Road, Colwyn Bay, for preliminary consideration.

HAROLD E. BRAITHWAITE,
Town Clerk.

Town Hall, Colwyn Bay.
13th August, 1959. 1276

## SITUATIONS VACANT

*(See "Replies to Box Numbers" above)*

## CITY OF SALISBURY SOUTHERN RHODESIA ELECTRICITY DEPARTMENT

**Vacancy for Electrical Engineer (Installation)**
**Salary scale £1,000 × £100 to £1,300 × £75 to £1,525 × £50 to £1,725 p.a.**

APPLICATIONS are invited for the fixed establishment post of ELECTRICAL ENGINEER (Installation) in the Salisbury Municipal Electricity Department, on the scale £1,000 × £100 to £1,300 × £75 to £1,525 × £50 to £1,725 p.a. No cost of living or other allowances are payable.

Commencing salary is based on qualifications and experience. There is a barrier at £1,525 p.a., above which no engineer can rise without being a Corporate Member of the British Institution of Electrical Engineers, and the maximum entry point into the grade is £1,575.

Candidates must be Graduates of the British Institution of Electrical Engineers and/or hold an equivalent electrical engineering degree.

The post requires experience in the general application of electricity to industrial, commercial and domestic premises, the preparation of estimates for and planning of such installations, general knowledge of electricity regulations, and the commissioning and maintenance of electrical plant and installations. The successful candidate will serve in the Consumers' Section as assistant to the Senior Electrical Engineer (Installation).

The appointment will be subject to the City Council's Service and Leave Regulations. The successful candidate will be required to furnish to the Council a satisfactory medical certificate of fitness and to serve a probationary period of not less than six months. He must also be able to comply with the requirements of the immigration authorities.

Candidates must submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received. Age, place of birth, nationality and marital state should be stated and copies of not more than three recent testimonials may be forwarded.

Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Davis & Soper Ltd., 52 and 54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before the 7th September, 1959. 1155

## EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced Engineers for the following positions:—

**Derby and Burton Sub-Area**

(1) SECOND ASSISTANT ENGINEER (Changeover) (Vacancy No. 83/59).
Salary N.J.B. Class J, Grade 8, £1,025 × £20 to £1,085 per annum.
The main duties of the appointment initially will be the preparation of changeover schemes and the co-ordination of changeover activities.

(2) THIRD ASSISTANT DISTRICT ENGINEER, Burton District (Vacancy No. 84/59).
Salary N.J.B. Class F, Grade 9, £815 × £15 to £860 per annum.
The duties of the post include assisting in the construction, maintenance and operation of both underground and overhead networks up to and including 11 kV.
The successful candidate will be required to undertake standby duties and to reside in or near Burton.

Applications, giving details of age, qualifications, experience, present position and salary, should be forwarded to the Manager, Derby and Burton Sub-Area, Electricity Offices, Irongate, Derby, within fourteen days of the date of this advertisement. Please quote above vacancy number.

**Northamptonshire Sub-Area**

(1) SECOND ASSISTANT ENGINEER (Development and Construction Section) (Vacancy No. 63/59).
Salary N.J.B. Class K, Grade 7, £1,195 × £25 to £1,270 per annum.
Preference will be given to candidates who possess a technical qualification equivalent at least to the Higher National Certificate in Electrical Engineering.
The duties of the appointment will consist of field planning, survey, construction and maintenance of high-voltage overhead and underground circuits up to and including 33 kV and will be related to work by direct labour and the supervision of contractors.
Experience in the preparation of specifications and estimates would be an advantage.

(2) THIRD ASSISTANT ENGINEER (Development and Construction Section) (Vacancy No. 63/59).
Salary N.J.B. Class K, Grade 9, £1,025 × £20 to £1,085 per annum, or Class K, Grade 10, £965 × £20 to £1,025 per annum, according to experience and qualifications.
Preference will be given to candidates who possess a technical qualification equivalent at least to the Higher National Certificate in Electrical Engineering.
The duties of the appointment will consist of assisting in planning and design and the preparation of specifications for both underground and overhead distribution systems up to and including 33 kV, and the estimating and preparation of schemes for approval.

(3) FOURTH ASSISTANT ENGINEER (Shift Operation) (Vacancy No. 67/59).
Salary N.J.B. Class K, Grade 12, £860 × £15 to £905 per annum plus 10% shift allowance.
Candidates should have had experience of switching operations on a high-voltage distribution system, preferably including both urban and rural networks. Experience in the issue and cancellation of permits to work under the C.E. safety rules, or acting as Control Engineer for part of a high-voltage system, would be an advantage.

(4) THIRD ASSISTANT ENGINEER (Operation Section) (Vacancy No. 72/59).
Salary N.J.B. Class K, Grade 11, £910 × £15 to £955 per annum.
Candidates, who must possess a current driving licence, should have had a communications engineering training and be familiar with automatic and manual telephone equipment and exchanges. A basic knowledge of V.H.F. radio would be an advantage.

Applications, stating age, education, experience, qualifications, present position and salary, should be forwarded to the Manager, Northamptonshire Sub-Area, 25, Bridge Street, Northampton, within fourteen days of the date of this advertisement. Please quote above vacancy number. 1240

# CENTRAL ELECTRICITY GENERATING BOARD

## OPERATIONS DEPARTMENT

## NUCLEAR POWER STATIONS

**ASSISTANT INSTRUMENT ENGINEERS**

required for training with a view to ultimate employment in a nuclear power station on the maintenance of a wide variety of instrumentation.

Previous experience of instrument work is not essential, but qualifications leading to Corporate Membership of the Institution of Electrical and/or Mechanical Engineers are required.

Each successful candidate will be required to attend training courses which might extend to 12 months. Theoretical instruction would include nuclear technology, electronics and instrument engineering. The practical training would be on instrument work at a nuclear power station.

Initial salary within the range £1,090 - £1,300 p.a.

Applications, stating age, qualifications, experience, present position and salary, to the Personnel Officer, 24/30, Holborn, London, E.C.1, by 1st September, 1959. Envelopes should be marked "Confidential—Ref. ER.328."

1268

## SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the undernoted superannuable appointments :—

(1) ASSISTANT MAINTENANCE ENGINEER (Mechanical), KINCARDINE GENERATING STATION (Ref. G.13/59).

Applicants should have had a sound technical training and preferably possess a Higher National Certificate in Mechanical Engineering. Experience on maintenance work, preferably with turbo-alternators and steam generating plant, would be desirable.

Salary N.J.B. Class K, Grade 7, £1,195/£1,270 per annum (rising to Class M, Grade 7, £1,360/£1,450 per annum).

(2) ASSISTANT MAINTENANCE ENGINEER (Electrical), KINCARDINE GENERATING STATION (Ref. G.14/59).

Applicants should have had a sound technical training and preferably possess a Higher National Certificate in Electrical Engineering. Experience on planned maintenance of electrical equipment and generating station control equipment is desirable.

Salary N.J.B. Class K, Grade 7, £1,195/£1,270 per annum (rising to Class M, Grade 7, £1,360/£1,450 per annum).

(3) ASSISTANT SHIFT CHARGE ENGINEER, PORTOBELLO GENERATING STATION (Ref. G.15/59).

Applicants should have had considerable experience in a modern generating station and preferably possess a Higher National Certificate in Electrical or Mechanical Engineering.

Salary N.J.B. Class K, Grade 8, £1,095/£1,170 per annum plus shift allowance of 10% per annum.

(4) MAINTENANCE ENGINEER (Electrical), BARONY GENERATING STATION, CUMNOCK (Ref. G.16/59).

Applicants should have had a sound technical training and preferably possess a Higher National Certificate in Electrical Engineering. They should also have had experience on planned maintenance of electrical equipment and generating station control equipment.

Salary N.J.B. Class F, Grade 6, £965/£1,025 per annum.

Housing accommodation may be made available for posts (1), (2) and (4), if necessary.

Applications, quoting appropriate reference, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, not later than 4th September, 1959. 1265

## RICHARD THOMAS & BALDWINS LIMITED

invite applications for positions of

## ELECTRICAL DRAUGHTSMEN

at their Central Engineering Department in South Wales.

Applicants should have had experience in general design and layout of power and lighting installations for large heavy industrial projects. Previous electrical drawing office experience is essential. Salary commensurate with experience and qualifications.

Apply, giving full details of experience, qualifications and age, to :—

**General Manager (Engineering)**
**RICHARD THOMAS & BALDWINS LTD.**
**42, Park Street, Bridgend, Glam**

1273

## ESSEX

**South-East Essex Technical College, Longbridge Road, Dagenham**

REQUIRED as soon as possible :—

1. LECTURER in Electrical Engineering to lecture to H.N.C. level in electrical subjects and in Advanced Electrical Engineering and Electrical Machines or Electricity Supply for the I.E.E. Part III Examination. Candidates should have a degree or at least be Corporate Members of the Institution of Electrical Engineers and have had teaching as well as industrial experience.
2. GRADE B ASSISTANT in Electrical Engineering for O.N.C. subjects and C. and G. Electrical Installation work. Candidates should be Corporate Members of the Institution of Electrical Engineers with teaching experience or teacher training.

Salaries in accordance with the Burnham Further Education Report, 1956, plus London allowance and 5% addition. These salaries are under review and may be increased from 1st October, 1959.

Details and forms (stamped addressed foolscap envelope) from the Clerk to the Governors at the College. Closing date 5th September, 1959. 1211

## SOUTHERN ELECTRICITY BOARD

### FIRST ASSISTANT DISTRICT ENGINEER
(Maintenance and Operation)

Reading District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class J, Grade 5 (£1,270-£1,360 per annum). N.J.B. conditions of service.

Applicants, who must possess suitable technical qualifications, should have had extensive experience of system operation, and of the maintenance of switchgear, transformers and mains up to and including 33 kV, including minor construction work, and the commissioning of new mains and plant. His duties will include the supervision of technical staff engaged in this work. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.1071, not later than 31st August, 1959.

### THERMAL STORAGE ENGINEER

Sub-Area Office of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class L, Grade 10 (£1,025 × £20 to £1,085 per annum). N.J.B. conditions of service.

The successful applicant will be directly responsible to the Senior Assistant Commercial Engineer (Sales and Contracting). He will be required to specialise in the latest methods and techniques of thermal storage application and to give advice on these subjects when requested.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1049, not later than 31st August, 1959.

### ASSISTANT ENGINEER (Planning)

Sub-Area Engineering Department of No. 1 (Southall) Sub-Area, located at Waterloo Road, Uxbridge. Salary N.J.B. Class M, Grade 13 (£960 × £15 to £1,005 per annum, inclusive of London allowance). N.J.B. conditions of service.

The duties of the post will be to assist in the preparation of schemes and estimates for extensions and/or reinforcements to overhead and underground H.V. and L.V. networks.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him, quoting Z.1034, not later than 31st August, 1959.

### INSTALLATION ENGINEER

Greenford District of No. 1 (Southall) Sub-Area. Salary N.J.B. Class G, Grade 9 (£860 × £15 to £905 per annum, plus London allowance). N.J.B. conditions of service.

Applicants should be qualified to accept responsibility for all installation and maintenance work in the District and branches, and to collaborate with the Development Engineer and District Commercial Engineer in the preparation of estimates for contracting work, particularly those of an exceptional nature.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him, quoting Z.1044, not later than 31st August, 1959.

### ASSISTANT ENGINEER
(Maintenance and Operation)

Uxbridge District of No. 1 (Southall) Sub-Area. Salary N.J.B. Class F, Grade 9 (£815 × £15 to £860 p.a., plus London allowance). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of switchgear, transformers, auxiliary gear, underground cable and overhead line systems up to and including 11 kV. The possession of suitable technical qualifications will be an advantage. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him, quoting Z.1050, not later than 31st August, 1959.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 1270

## TRANSFORMER DESIGNERS

GRESHAM TRANSFORMERS Ltd., Twickenham Road, Hanworth, Middlesex, have vacancies for transformer designers with experience in the range 5-5,000 kVA. Applications with particulars of experience to—Chief Engineer. 1124

***Situations Vacant** (continued)*

## CENTRAL ELECTRICITY GENERATING BOARD

### South Western Division

THIRD ASSISTANT ENGINEER required in the System Design Section of the Technical Department at Divisional Headquarters, Bristol. Superannuation scheme. Salary N.J.B. Class AX/DX, Grade 6, £925-£1,050/£1,140 per annum.

Applicants should possess qualifications leading to A.M.I.E.E. Candidates should have a sound knowledge of transmission theory and preferably have practical experience on protective systems and system design.

Experience on protective gear co-ordination and on the use of D.C. calculators is desirable.

FOURTH ASSISTANT ENGINEER required in the System Operation Department at Divisional Headquarters, near Bristol.

Superannuation scheme. Salary N.J.B. Class AX/EX, Grade 8, £735-£860/£960 per annum.

Applicants should have had a good general and technical education to Higher National Certificate standard with an aptitude for mathematics. Steam generating station experience is desirable. Duties include general statistical work, particularly costing. Some day/evening shift duties in the control room may be required, for which the 10% shift allowance would be paid.

SENIOR DRAUGHTSMAN (Electrical) required in the Transmission Department at Divisional Headquarters, Bristol.

Superannuation scheme. Salary N.J.B. Schedule D, Grade 5, £790-£890 per annum.

The successful candidate will be required principally to prepare electrical layout drawings for outdoor grid substations, but general adaptability is considered important. Technical education to H.N.C. is desirable.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 29th August, 1959. 1241

## MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts :—

### Board Headquarters

DEPUTY CHIEF ACCOUNTANT.

Applicants should be qualified accountants and should have had wide experience in a public utility undertaking. The salary will be in accordance with N.J.M. Class C, Grade 9 (£2,760/£2,960 per annum).

Applications, by letter, giving full details of age, qualifications, experience, present position and salary, should be forwarded within 14 days to the Secretary, Midlands Electricity Board, Mucklow Hill, Halesowen, Nr. Birmingham.

### South Staffs and North Worcs Sub-Area

SECOND ASSISTANT ENGINEER (Building) (Headquarters).

Duties will include supervising the erection, alteration and maintenance of a wide variety of buildings, including offices, stores, workshops, substations, showrooms and other building works. Applicants should have had experience of the control and supervision of building operatives, and possession of appropriate qualifications will be an advantage. Experience in the preparation of plans and specifications would be of value. Salary £1,270/£1,360 per annum (N.J.B. Grade L.7).

SECOND ASSISTANT ENGINEER (Headquarters).

Duties will include site surveys, building planning and design and the preparation of drawings, quantities and specifications for a wide variety of buildings, including offices, stores, workshops, substations and showrooms. Experience in supervising building works would be of value. Possession of an appropriate qualification will be an advantage. Salary £1,270/£1,360 per annum (N.J.B. Grade L.7).

Apply, by letter, within 14 days, stating age, experience, present position and salary to Mr. H. A. P. Caddell (Ref. CW), Sub-Area Manager, Midlands Electricity Board, P.O. Box No. 9, Toll End Road, Tipton, Staffs.

### Wolverhampton and District Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER (Lichfield).

Experience necessary in all branches of distribution work, including construction, maintenance and operation of high and low voltage underground and overhead systems and substations and the planning of system reinforcements and mains extensions. Technical qualifications desirable. Salary £860/£905 per annum (N.J.B. Grade E.7).

GENERAL ASSISTANT DISTRICT ENGINEER (Lichfield).

The successful applicant will be required to assist in the construction and maintenance of overhead and underground mains and substations. Technical qualifications desirable. Salary £655/£700 per annum (N.J.B. Grade E.11).

Apply, by letter, within 14 days, stating age, experience, present salary and position to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton, Staffs.

### Worcester and District Sub-Area

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER (Redditch/Bromsgrove District).

Applicants should have a sound commercial background. Duties will be primarily concerned with industrial load development and include negotiation of terms for commercial and industrial supplies, tariffs, etc. Salary £965/£1,025 per annum (N.J.B. Grade F.6).

WAYLEAVE OFFICER (Kidderminster).

Duties include plotting of routes and the negotiation and preparation of wayleave agreements, etc. Salary £640/£700 per annum (N.J.C. Grade 2).

DEMONSTRATOR (FEMALE) (Evesham).

Applicants must have had a good education and should have a certificate of a recognised domestic training college and/or the E.A.W. Certificate. Some selling experience would be an advantage. Duties include lecture demonstrations in service centres and on consumers' premises and advice to consumers on the selection and use of electrical apparatus. Applicants must be prepared to take an active part in the sales organisation. Salary £525/£625 per annum (N.J.C. Grade 1).

Apply, by letter, within 14 days, stating age, qualifications, experience, present position and salary to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Blackpole Road, Worcester.

A. STEPHENS,
Secretary. 1259

## ELECTRICAL ENGINEER

age about 25, of H.N.C. standard, required for Marine Projects Department of

**ENGLISH ELECTRIC, RUGBY**

A good knowledge of medium range A.C. and D.C. machines and switchgear, preferably with marine applications, is desirable.

The position offers good prospects to a young engineer wishing to embark on a commercial career.

Write giving full details to Dept. C.P.S., Marconi House, 336/7, Strand, London, W.C.2, quoting reference ER.1118C.

1196

## CENTRAL ELECTRICITY GENERATING BOARD

### Southern Division

### Grade 10 Engineer (Instruments), Poole Generating Station

APPLICANTS should have previous experience of modern generating station plant. A good working knowledge of all types of instruments, auto-controls and electronics is essential. Experience in the supervision and training of employees repairing and maintaining instruments will be an advantage.

Candidates should have had a sound technical training and possess qualifications leading to corporate membership of an appropriate professional institution or equivalent qualifications.

Salary N.J.B. Grade K.10, £965 × £20 to £1,025 per annum.

Special application forms obtainable from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 31st August, 1959. 1274

## CENTRAL ELECTRICITY GENERATING BOARD

### London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or B. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

ASSISTANT ENGINEER (MECHANICAL MAINTENANCE), BARKING A/B POWER STATION (Vacancy No. 59/757).

Applicants should have had considerable experience with the mechanical maintenance and overhaul of large turbo-alternators, P.F. and chain grate boilers and auxiliary plant. They should also be capable of undertaking the estimating, planning and co-ordinating of work associated with the various sections of mechanical maintenance in large power stations. Salary Class L, Grade 9 = £1,145 p.a.

DIVISIONAL ASSISTANT CHEMIST, DIVISIONAL LABORATORY, BATTERSEA POWER STATION (Vacancy No. 59/758).

The work is diverse, including a considerable amount of non-routine chemical analyses, and would appeal to a chemist having good fundamental knowledge. Applicants should hold a degree in chemistry or equivalent, and industrial experience is preferred. Salary Class AX/EX, Grade 7 or 8 = £775-£1,115 p.a.

ASSISTANT ENGINEER (OPERATION), FULHAM POWER STATION (Vacancy No. 59/759).

Sound technical training with experience of large power station plant operation. Will be required to take over duties of other shift engineers for relief purposes. Salary Class K, Grade 9 = £1,075 plus £102 10s. shift p.a.

CHEMICAL ASSISTANT, FULHAM POWER STATION (Vacancy No. 59/760).

Applicants should be between 16 and 22 years with G.C.E. "O" level in scientific subjects, including chemistry. Facilities available for further education on day release up to 21 years. Salary according to age up to £600 at 22 years.

ASSISTANT ENGINEER (MECHANICAL), GROVE ROAD POWER STATION (Vacancy No. 59/761).

To take charge of drawing office work, lifting tackle tests and records, and to assist generally. Salary Class F, Grade 11 = £750 p.a.

SHIFT CHARGE ENGINEER, ST. MARYLEBONE POWER STATION (Vacancy No. 59/762).

Good technical training and experience of power station operation, including character and ability to supervise staff. Salary Class E, Grade 7 = £910 plus £86 shift p.a.

CHEMICAL ASSISTANT, TAYLOR'S LANE POWER STATION (Vacancy No. 59/763).

Applicants should be between 16 and 22 years with G.C.E. "O" level in scientific subjects, including chemistry. Facilities available for further education up to 21 years. Salary according to age up to £600 per annum at 22 years.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, Personnel Officer, London Division, P.O. Box 136, London, W.1, by 24th August, 1959. 1244

## CITY OF PORT ELIZABETH, UNION OF SOUTH AFRICA

### Vacancies for Electricity Meter Testers

APPLICATIONS are invited for permanent positions of METER TESTERS fully experienced in polyphase meter testing control apparatus, instrument standardising and meter testing procedures to the requirements of the British Electricity Meters Act.

The wages are 5s. plus 1d. annual increment to 5s. 6d. per hour plus a variable cost-of-living allowance at present 1s. 9.11d. per hour for married and 5.74d. per hour for single employees. There is a five-day working week of 46 hours.

Other conditions of service and arrangements regarding interview can be obtained by writing to Davis & Soper Ltd., 52 & 54, St. Mary Axe, London, E.C.3. 1201

## CITY OF SALISBURY, SOUTHERN RHODESIA

**Electricity Department**

Vacancy for
POWER STATION MAINTENANCE FOREMAN (Mechanical)

APPLICATIONS are invited for the fixed establishment post of Power Station Maintenance Foreman (Mechanical) on the scale £1,220 × £50 to £1,420 p.a., commencing salary at the minimum of the grade. No cost-of-living or other allowances are payable.

Applicants should have served an approved apprenticeship in a mechanical engineering trade and have had subsequent experience in a power station carrying out the erection and maintenance of thermal power plant including large high-pressure turbo-generators together with auxiliary plant, large high-pressure boilers and coal handling plant, etc. Candidates must be capable of controlling staff and maintaining records in connection with maintenance work under the Maintenance Engineer.

The appointment is subject to the Council's Service and Leave Regulations as amended from time to time. The successful applicant will be required to submit a satisfactory medical certificate of fitness, and to serve a probationary period of not less than six months, and if thereafter confirmed in his appointment, to join the Southern Rhodesia Local Authorities' Joint Pension and Widows' and Orphans' Fund. He must also be able to comply with the requirements of the Immigration Authorities.

Candidates must submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received. Age, place of birth, nationality and marital state should be included and copies of not more than three recent testimonials may be forwarded.

Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Davis & Soper Limited, 52 & 54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 12th September, 1959. 1233

## SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable appointments in the Development Section of the Chief Commercial Officer's Department, Board Headquarters, Glasgow :—

(1) THIRD ASSISTANT ENGINEER (Ref. C.11/59).

Salary £925/£1,170 per annum.

Duties will include the design of electrical space heating schemes including floor warming, electrode boilers and block storage heaters.

Candidates should have a sound technical training in mechanical and electrical engineering and experience in the preparation of estimates, specifications and drawings for central heating plants is required. Qualifications leading to membership of the Institution of Electrical Engineers and/or the Institution of Heating and Ventilating Engineers are desirable.

(2) GENERAL ASSISTANT ENGINEER (Ref. C.12/59).

Salary £575/£725 per annum.

Duties will be to assist in load development work and include the constructing of prototype equipment in the Board's new industrial development workshop.

Candidates must have served an apprenticeship in a mechanical or electrical trade and have practical experience in general engineering practice, including the machining of metals and fabrication by welding. A knowledge of electrical installation work and the use of indicating, recording and control instruments would be an advantage.

The successful candidate may on occasion be required to work on consumers' premises elsewhere in the Board's district.

Salaries, as above, will be in accordance with Class AX/EX, Grades 6 and 9 respectively on Schedule B to the National Joint Board Agreement.

Apply, quoting appropriate reference number, on standard form AE.6, available from the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, not later than 31st August, 1959. 1266

## SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following positions :—

THIRD ASSISTANT DISTRICT ENGINEER (Operation and Maintenance), BARNSTAPLE.

Salary according to Class E, Grade 9 (£815 × £15 to £860 per annum) of Schedule A of the N.J.B. Agreement.

The successful candidate will be required to render general assistance in the Engineering Department and to be responsible for work connected with the operation and maintenance of E.H.T. and L.V. mains and plant.

Applicants should have had sound practical experience in the operation and maintenance of 11-kV and L.V. underground and overhead networks, substation plant and ancillary equipment.

Possession of appropriate technical qualifications at least equivalent to the Higher National Certificate in Electrical Engineering is necessary and a current driving licence is desirable.

THIRD ASSISTANT DISTRICT ENGINEER (Construction), BARNSTAPLE.

Salary according to Class E, Grade 9 (£765 × £15 to £810 per annum) of Schedule A of the N.J.B. Agreement.

Duties will include all types of construction work, including H.V. and L.V. overhead lines and underground cables; preparing material schedules, phasing of work and supply of materials; preparing specifications, reports and statistics, and the maintenance of progress records.

Possession of appropriate technical qualifications at least equivalent to the Higher National Certificate and the possession of a current driving licence is desirable. The successful candidate may be required to take part in a standby rota to deal with faults and interruptions to the supply in the District.

Applications for each of the above posts to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY, from the District Manager, South Western Electricity Board, 7, Cross Street, Barnstaple, Devon.

Closing date for receipt of completed applications is 5th September, 1959.

COMMERCIAL ASSISTANT, NEWTON ABBOT BRANCH, TORBAY DISTRICT.

COMMERCIAL ASSISTANT (Designate), TEIGNMOUTH BRANCH, TORBAY DISTRICT.

For each of the above posts salary within Grade 3 (£720 × £20 to £780 per annum) of the N.J.C. Agreement.

The candidate appointed will be required to assist the Branch Manager in all aspects of the commercial work of the branch. He will be required to arrange and supervise the work of sales representatives, service centre staff and the branch contracting unit, and also to deal with commercial, domestic and agricultural enquiries.

Candidates must have drive and initiative, knowledge of commercial work generally, and the ability to supervise a contracting unit. Possession of a current driving licence and the E.D.A. Salesmanship Certificate will be an advantage.

Applications for each of the above posts to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY, from the District Manager, South Western Electricity Board, Electric House, Union Street, Torquay.

Closing date for receipt of completed applications is 5th September, 1959. 1199

## HIGH VOLTAGE RESEARCH

GRADUATES IN ELECTRICAL ENGINEERING or PHYSICS or holders of the H.N.C. in Electrical Engineering are required for experimental research on HIGH-VOLTAGE PROBLEMS (in a HIGH-VOLTAGE RESEARCH LABORATORY). The work covers a wide range and includes the construction and use of impulse voltage and impulse current generators, high direct voltage generators, and electronic equipment.

Applicants should be able to carry out investigations without close supervision.

Previous works training and laboratory experience are desirable but not essential.

Applications, quoting reference N.13 and giving relevant personal details, qualifications and experience, should be sent to :—

**Personnel Manager**
**METROPOLITAN-VICKERS ELECTRICAL CO. LTD.**
**Trafford Park, Manchester, 17**

1085

## SMITHS MOTOR ACCESSORY DIVISION

**Electrical Development Engineer**

THIS position is concerned with test and development work in an electrical department concerned with development of small electrical and electronic components. Applicants should have had previous experience in this field. An apprenticeship plus H.N.C. (Electrical) would be an advantage.

The salary will be fixed according to qualifications and experience, and the successful candidate will be entitled to rent a new house situated near the factory on the outskirts of Witney.

Applications, in confidence, to :—

**Personnel Manager**
**S. SMITH & SONS (ENGLAND) LTD.**
**Motor Accessory Division**
**Witney, Oxon**

1247

## TECHNICAL WRITER

BRUCE PEEBLES & Co. Limited, East Pilton, Edinburgh, 5, require a fully experienced Technical Writer. Applicants, age bracket 28-35, should have recognised qualifications in electrical engineering.

The work requires the ability to write lucid descriptions of products and processes covering all aspects of rotating plant, transformers, rectifiers and electronic equipments for publicity, technical press and direct mail. High standards of accuracy and ability to write in clear concise English are called for. The position will be permanent and staff pension and production bonus schemes are in operation. Assistance with removal expenses and house purchase where necessary.

The man chosen will be under the Publicity Manager, but must be able to work and co-ordinate detailed information without constant supervision.

Send full details of age, education, experience and salary expected to Mr. J. S. Baillie, Publicity Manager, at the above address. 1041

A CHARTERED ELECTRICAL ENGINEER required by

**W. H. ALLEN SONS & CO. LTD.**
**Queens Engineering Works, Bedford**

to undertake commercial work involving the preparation of tenders for A.C. and D.C. machines, control gear and switchgear, for marine and industrial applications, including water undertakings.

Some experience as outside representative desirable. Preferred age range 30-40 years.

Applications in writing to the Personnel Manager.

1174

*Situations Vacant (continued)*

## EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

THIRD ASSISTANT ENGINEERS

(a) Bedford District (153/59.R).
(b) North Essex District (154/59.R).
(c) Barnet District (Ref. 870) (155/59.R).
(d) Enfield District (Ref. 881) (156/59.R).
(e) Hertford District (Ref. 840) (157/59.R).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary (a), (b) and (c) N.J.B. Class F, Grade 9 (£815 - £860); (d) and (e) N.J.B. Class G, Grade 9 (£860-£905) plus London allowance for posts (c) and (d).

Apply by letter, by 4th September, 1959, as follows :—

(a) The Manager, Bedford District, Eastern Electricity Board, Prebend Street, Bedford.
(b) J. C. Horrell, M.I.E.E., Manager, Eastern Electricity Board, Cressing Road, Braintree, Essex.
(c) L. F. G. Baker, Manager, Eastern Electricity Board, 7c, High Street, Barnet, Herts.
(d) A. T. Durbridge, Manager, Eastern Electricity Board, 40, Church Street, Enfield.
(e) W. H. Hatton-Ward, Assoc.I.E.E., Manager, Eastern Electricity Board, Bridgefoot, Ware, Herts.

**Northmet Sub-Area**

SUB-AREA HEADQUARTERS,
Southgate, London, N.14

FOURTH ASSISTANT ENGINEER
(System Control) (Ref. 833)
(158/59.R).

Candidates should have had a sound technical training and experience in construction, operation and maintenance, and should have a knowledge of system protection.

Salary N.J.B. Class M, Grade 13 (£910-£955) plus London allowance, plus a shift allowance of 10% over and above the schedule salary in accordance with Clause 4 of the N.J.B. Agreement.

(i) ENGINEERING DRAUGHTSMEN
(Substations Drawing Office)
(Ref. 871) (159/59.R).

(ii) ENGINEERING DRAUGHTSMEN
(Civil Engineering and Building Section)
(Ref. 831) (160/59.R).

For posts (i) the duties include layout of switchgear, transformers and associated equipment for outdoor and indoor type substations up to 33 kV.

For posts (ii) candidates should have had a good technical training and experience in the preparation of plans and detailed drawings of building and civil engineering works including substations, service centres, workshops, offices, etc.

Salary N.J.B. Schedule D, Grade 6 (£620-£740) plus London allowance.

For these appointments apply by letter to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, by 4th September, 1959. 1205

## COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE

**Office of the County Architect**

APPLICATIONS are invited for the following appointment at the Wakefield Divisional Office :—

ELECTRICAL ENGINEERING INSPECTOR, Grade A.P.T. 1, £610-£765. Candidates must possess the Ordinary National Certificate in Electrical Engineering and have had practical experience in inspecting, supervising and testing electric lighting and power installations, and be able to prepare specifications and drawings for simple maintenance schemes.

Applications to be submitted by the 8th September, 1959, on forms to be obtained from and returned to the undersigned.

A. W. GLOVER, F.R.I.B.A.,
County Architect.

Bishopgarth,
Westfield Road, Wakefield. 1250

## CITY OF SALISBURY, SOUTHERN RHODESIA

**Electricity Department**

Vacancy for ELECTRICAL ENGINEER (Protection)

Salary Scale £1,000 × £100 to £1,300 × £75 to £1,525 × £50 to £1,725 p.a.

APPLICATIONS are invited for the fixed establishment post of ELECTRICAL ENGINEER (Protection) in the Salisbury Municipal Electricity Department, on the scale £1,000 × £100 to £1,300 × £75 to £1,525 × £50 to £1,725 p.a. No cost-of-living or other allowances are payable.

Commencing salary is based on qualifications and experience. There is a barrier at £1,525 p.a., above which no engineer can rise without being a Corporate Member of the British Institution of Electrical Engineers, and the maximum entry point into the grade is £1,575 per annum.

Candidates must be Graduates of the British Institution of Electrical Engineers and/or hold an equivalent electrical engineering degree, and have had not less than five years' experience in general protection work.

The successful applicant will work under the direction of the Test Engineer in the Consumers' Engineers' Section and his duties will comprise mainly :—

1. Design and commissioning of all types of protection schemes on generators, feeders, motors, transformers and other types of electrical equipment.
2. Determination of relay settings and the calculation of fault currents over the system.
3. Supervision of staff engaged in the maintenance and repair of all relays and instruments associated with protection schemes.

The Department has an extensive supervisory indication, control and telemetering scheme, and experience with similar equipment is desirable. Experience with electronic equipment would be considered an advantage.

The appointment will be subject to the City Council's Service and Leave Regulations. The successful candidate will be required to furnish to the Council a satisfactory medical certificate of fitness and to serve a probationary period of not less than six months and, if thereafter confirmed in his appointment, to join the Southern Rhodesia Joint Pension and Widows' and Orphans' Fund. He must also be able to comply with the requirements of the Immigration Authorities.

Candidates must submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received. Age, place of birth, nationality and marital state should be stated and copies of not more than three recent testimonials may be forwarded.

Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Davis & Soper Limited, 52 & 54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 12th September, 1959. 1232

## FISONS LIMITED

require an ELECTRICAL DRAUGHTSMAN at their Head Office at Felixstowe for industrial lighting, power and distribution schemes.

Applicants should have reached at least Ordinary National Certificate standard and have experience in contract work. Age not less than 25 years.

Salary according to experience and qualifications. The company operates a pension scheme which for married staff includes provision for widows and dependent children.

Applications with full particulars should be addressed to—

**Group Personnel Officer (IY.29)**
**Harvest House, Felixstowe, Suffolk**

1220

## YORKSHIRE ELECTRICITY BOARD

**No. 4 (Leeds) Sub-Area**

FOURTH ASSISTANT ENGINEERS (Meters, Testing and Protection): Two Posts. The successful applicants will be required to assist in the commissioning and maintenance of substation equipment, system protection, and/or in the running of the Meter Test Room. Graduate Membership of the Institution of Electrical Engineers or equivalent qualifications would be an advantage.

Salary N.J.B. Class L, Grade 13, £860/£15/£905 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Nr. Leeds, not later than 4th September, 1959.

**No. 2 (Huddersfield) Sub-Area**

HALIFAX DISTRICT

ASSISTANT INSTALLATION ENGINEER. Applicants must have had experience in the preparation of specifications and estimates and generally supervising schemes for electrical installations of all types. A good knowledge of the Electricity Supply Regulations and the Institution of Electrical Engineers' Regulations for the electrical equipment of buildings is essential. Graduate Membership of the Institution of Electrical Engineers or an equivalent qualification will be an advantage.

Salary N.J.B. Class J, Grade 12, £815/£15/£860 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than 4th September, 1959.

**No. 5 (Wakefield) Sub-Area**

CASTLEFORD DISTRICT

ASSISTANT CONSUMERS' ENGINEER. Applicants, who must have had a sound practical training and some experience in the work of a Consumers' Engineer, will be required to give advice to all classes of consumer concerning the utilisation of electricity. Experience in the interpretation of the Institution of Electrical Engineers' wiring regulations, obtaining off-peak heating loads, street lighting negotiations and tariffs will be of advantage.

Preference will be given to applicants holding a Higher National Certificate in Electrical Engineering or equivalent qualifications.

Salary N.J.B. Class F, Grade 10, £765/£15/£810 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 4th September, 1959.

**No. 1 (Bradford) Sub-Area**

CLERK OF WORKS. Applications are invited for the appointment of a Clerk of Works to supervise various building and civil engineering works within the Sub-Area.

Applicants must have a thorough knowledge of the building trade, including experience in connection with reinforced concrete structures and foundations. They must be conversant with plans, specifications, bills of quantities, and competent to set out work, give levels and keep all necessary records and progress reports.

Salary N.J.B. Class K, Grade 13, £815/£15/£860 per annum plus £95 per annum personal allowance.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Road, Bradford, not later than 4th September, 1959. 1236

## OVERHEAD LINESMEN

APPLICATIONS are invited for vacancies of OVERHEAD POWER LINESMEN experienced in the construction and maintenance of overhead lines up to and including 33 kV, but particularly with knowledge of construction to BS.1320. The work will be near Bedford and Home Counties.

Apply—C. Maurice Contractors Ltd., Lindsey Road, Bishop's Stortford, Herts. 984

## NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

**Dundee Area**

APPLICATIONS are invited from suitably qualified Engineers for the following appointments :—

SECOND ASSISTANT DISTRICT ENGINEER (No. 4 City District).

Applicants should have a sound practical training and some experience in distribution work. Duties will include the operation, maintenance and construction of H.V. and L.V. substations and underground cable networks.

The minimum educational qualification is the Higher National Certificate in Electrical Engineering, and preference will be given to applicants who are Members of the Institution of Electrical Engineers or who have qualifications leading to such membership.

Salary will be in accordance with N.J.B. Agreement, Schedule A, Class F, Grade 7, £910 to £955.

THIRD ASSISTANT ENGINEER (Protection and Testing).

Applicants should have experience in conventional methods of protection, in pressure testing, fault location and fault analysis. Experience in carrying out primary and second injection tests on new and existing circuits is necessary.

Educational and professional qualifications should be as for the first-named position.

Salary will be in accordance with N.J.B. Agreement, Schedule A, Class H, Grade 9, £910 to £955.

THIRD ASSISTANT ENGINEER (Construction).

Applicants should have a sound practical training and some experience in the construction and maintenance of indoor and outdoor substations. The duties may also include erection of overhead lines and laying of underground cables, and will be associated mainly with voltages of 33 kV and above. Work on lower voltages does occur from time to time.

Educational and professional qualifications should be as for the first-named position.

Salary will be in accordance with N.J.B. Agreement, Schedule A, Class H, Grade 9, £910 to £955.

GENERAL ASSISTANT ENGINEER (Planning).

Applicants should preferably have had some experience in city and rural distribution work up to 33 kV. Duties will include assisting in the planning of H.V. and L.V. reinforcements, new housing schemes and city, rural development schemes, and also in the design of outdoor and indoor substations.

Educational qualifications should be as for the first-named position.

Salary will be in accordance with N.J.B. Agreement. Schedule A, Class H, Grade 12, £765 to £810.

Application forms are obtainable from the undersigned and should be submitted by the 14th of September, 1959.

R. B. ANDERSON, M.I.Mech.E., M.I.E.E. Area Manager.

7, Dudhope Crescent Road, Dundee. 1292

## UNIVERSITY OF ST. ANDREWS

**Queen's College, Dundee**

APPLICATIONS are invited for the following post tenable in Queen's College, Dundee, in the University of St. Andrews, and commencing as soon as possible :—

LECTURESHIP in Electrical Engineering : Candidates should possess a good Honours Degree in Electrical Engineering or physics and industrial or research experience in light-current electrical engineering.

Further particulars with regard to post on application. Salary scale £900 × £50 to £1,350 × £75 to £1,650 (efficiency bar £1,350); placing according to qualifications and experience. F.S.S.U.; family allowance; grant towards removal expenses.

Applications (6 copies) containing the names of three referees, to the undernoted not later than 28th September, 1959.

PATRICK CUMMING, Joint Clerk to the University Court.

Queen's College, Dundee.
August, 1959. 1246

## YORKSHIRE ELECTRICITY BOARD

**No. 1 (Bradford) Sub-Area**

THIRD ASSISTANT ENGINEER (Distribution Design).

Applicants should posses technical qualifications equivalent to those for Corporate Membership of the Institution of Electrical Engineers and have experience in planning, design, and estimating of medium and high voltage overhead and underground distribution systems. Experience in the constrlction and maintenance of such systems would be an advantage.

Salary, N.J.B. Class K, Grade 10, £965/£20/£1,025 per annum.

KEIGHLEY DISTRICT

THIRD ASSISTANT DISTRICT ENGINEER.

Applicants should have passed the Associate Membership Examination of the Institution of Electrical Engineers, or hold equivalent qualifications, and have experience in construction, operation and maintenance of high voltage systems, underground cables and overhead lines and substations, and medium low voltage networks.

Candidates should be prepared to reside within the district and undertake stand-by duties.

Salary, N.J.B. Class F, Grade 9, £815/£15/£860 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Road, Bradford, not later than 4th September, 1959.

**No. 6 (Hull) Sub-Area**

GOOLE DISTRICT

SECOND ASSISIANT DISTRICT ENGINEER (Selby).

Applicants should have had sound practical experience in the operation, maintenance, planning and construction of H.V. and L.V. underground and overhead lines and substations in an extensive rural area.

Preference will be given to candidates who have the Higher National Certificate in Electrical Engineering or possess equivalent qualifications.

The successful candidate will be required to undertake standby duty and to reside in Selby or near vicinity.

Salary N.J.B. Class E, Grade 7, £860/£15/£905 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 4th September, 1959. 1286

## ASSISTANT TO THE ELECTRICAL ENGINEER

A VACANCY exists for an Assistant to the Electrical Engineer at a works employing 3,500 people and consuming approximately thirty million units of electricity a year. He will have special responsibility for the supervision of the section engaged in the installation and maintenance of all instrumentation in the works, the planning of new installations, and liaison with development departments on new projects, including measurement and control. Qualifications : full apprenticeship or graduate apprenticeship, university degree, or Graduate Membership of the Institution of Electrical Engineers.

Preferred age range 25 to 30, but not limited to this. Experience : some knowledge of industrial installation, maintenance work, and process control instrumentation.

Reply stating age, qualifications and experience to the Personnel Officer (Graduate Recruitment)—

**PILKINGTON BROTHERS LIMITED**
**St. Helens, Lancashire**

1204

## WESTINGHOUSE BRAKE AND SIGNAL COMPANY LIMITED

DEVELOPMENT ENGINEERS, Electrical and Electronic.

WE have vacancies for a number of Engineers up to the age of about 30 for development work on a wide range of equipments for Railway Signalling and Traffic Control Systems both for the British Railways Modernisation Plan and for Overseas Railways. The equipments involved may be electronic, electrical, electro-magnetic, electro-mechanical or electro-pneumatic or combinations of some of all of these. The work is extremely interesting to any Engineer with an enquiring mind and the desire to help in meeting the modern demand for increasing Automatic Control on the Railways.

Not only are there vacancies for Graduate Engineers, but also for those with H.N.C. or O.N.C. or C. & G. certificates and for those studying for any of these certificates.

ELECTRONIC ENGINEERS for Commissioning and Field Trials.

There are a number of vacancies for Engineers with Higher National Certificates, Electronics, or equivalent, for the above type of work, principally in Railway Marshalling yards where automatic control is being applied. The techniques involved include:—S.H.F. Radio, D.C. analogue computers and relay counting systems. Applicants must be willing to travel and eventually their headquarters would be at our Head Office, London. This work is of an interesting and novel character and forms part of the modernisation plan of British Railways.

No previous experience of any of the above types of work is expected, and suitable training will be provided depending on previous experience.

The positions are permanent and progressive for those showing ability and initiative, and offer experience in a wide field of Engineering products.

Holiday arrangements already made for this year will be honoured.

Salaries will be commensurate with age and experience. The Company operates a Pension Scheme.

Applicants should write giving full details of age, qualifications, training, experience and present salary, to The Personnel Superintendent, Westinghouse Brake & Signal Co. Ltd., Chippenham, Wilts, quoting reference EED/14/ER. 1282

## ELECTRICAL ENGINEER (PRODUCTION)

APPLICATIONS are invited for this new appointment. Candidates should have practical experience of control gear, electronics and automatic systems to organise, administer and supervise the creation of an electrical manufacturing unit in a primarily mechanical engineering factory.

The post will call for considerable tact, in addition to a sound technical and shop floor background.

A wide knowledge of sources of supply and market prices of electrical equipment is essential.

Candidates must have served a recognised apprenticeship and hold a Higher National Certificate in Electrical Engineering or Grad./Assoc. Membership of the Institution of Electrical Engineers.

Please give details of experience, etc., age and salary desired to—Box 1287.

## BRITISH ENGINE BOILER & ELECTRICAL INSURANCE CO. LTD.

**Longridge House, Manchester, 4**

ELECTRICAL SURVEYORS required. Permanent positions carrying progressive salary scale £800 to £1,100 and non-contributory pension. Candidates, age 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. 1262

*Situations Vacant (continued)*

## ROYAL NAVAL SCIENTIFIC SERVICE

VACANCIES for Senior Scientific Officers and Scientific Officers in the following localities :—

**LONDON AREA:** MECHANICAL ENGINEER with sound knowledge of basic principles of thermo and fluid dynamics to carry out research programme in a particular field of applied hydrodynamics. Experience in modern methods of design and research on axial flow compressors, turbines or pumps an advantage. MECHANICAL ENGINEER for work on propulsion problems. APPLIED MATHEMATICIAN for research of basic nature on stability of underwater vehicles; knowledge of theoretical hydrodynamics and theory of control systems an advantage. APPLIED MATHEMATICIAN or THEORETICAL PHYSICISTS for acoustic analysis. ELECTRONIC PHYSICISTS for data handling and analysis problems. PHYSICIST interested in operator performance. CLASSICAL PHYSICISTS.

**BALDOCK:** PHYSICISTS or APPLIED MATHEMATICIANS for research in Metal or Quantum Physics.

**PORTSMOUTH:** ELECTRONIC ENGINEERS for research on analoque computers and transistor circuits. ELECTRICAL ENGINEERS for research on small rotating electrical machinery. PHYSICISTS for optical systems and instrumentation. ELECTRO-MECHANICAL ENGINEERS for work on servo-mechanisms.

**PORTLAND:** PHYSICISTS or APPLIED MATHEMATICIANS for research on underwater acoustics. ELECTRONIC PHYSICISTS and ELECTRONIC ENGINEERS for design work. PHYSICAL CHEMISTS.

**POOLE:** CHEMICAL ENGINEERS. CHEMISTS for work on rubber technology.

**ROSYTH:** PHYSICISTS (Electronic).

Candidates must normally be natural-born British subjects of natural-born British parents, with First or Second Class Hons. Degrees. S.S.O.s must have had three years' postgraduate experience and be not less than 26 years of age.

Salaries (men): S.S.O. £1,233-£1,460; S.O. £655-£1,150 (London); somewhat lower in Provinces. Appointments unestablished (with F.S.S.U. benefits), but opportunities may occur for those between ages of 21 and 32 to compete for established posts.

Forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1 (quote A.220/9A). 1136

## CENTRAL ELECTRICITY GENERATING BOARD

### East Midlands Division

APPLICATIONS are invited for the following positions within the Division :—

FIRST ASSISTANT CHEMIST,
WILLINGTON "A" POWER STATION
(Vacancy No. 134/59).

Candidates must have had previous experience in a power station laboratory and should preferably be qualified for admission to the Associateship of the Royal Institute of Chemistry; consideration will, however, be given to suitably experienced holders of the Higher National Certificate in Chemistry.

Applicants must be familiar with the routine methods of sampling and analyses (including physical testing) of coal, oil, water and other materials and with the interpretation and application of the analytical results.

Salary will be in accordance with Class K, Grade 8 (£1,095-£1,170 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 28th August, 1959.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller.

5th August, 1959. 1234

## MUNICIPALITY OF LIVINGSTONE, NORTHERN RHODESIA

### Appointment of Engineering Assistant, Electricity Department

APPLICATIONS are invited from qualified Electrical Engineers for the position as ENGINEERING ASSISTANT in the Town Electrical Engineer's Department at a salary in accordance with Grade 9 (£1,190 × £60 to £1,490) per annum, commencing at the minimum of the grade, plus a variable temporary cost-of-living allowance which is at present 5% of the basic salary. There is a qualification barrier at the salary of £1,370 above which no person may proceed unless qualified as an associate member of the appropriate professional institution.

The successful applicant will be required to have a sound knowledge of distribution of electricity on systems operating at voltages up to 11 kV; be able to undertake an investigation of system losses; supervise the routine testing of cables, switchgear and meters, and to assist generally with the safe operation and maintenance of a municipal electricity supply system and ancillary services.

Free unfurnished housing is normally provided, but if not immediately available an allowance in lieu at the rate of £16 a month for a married officer and £8 a month for a single officer is payable.

The Council's conditions of service provide for contributory pension and medical aid schemes, together with assisted passages and generous leave provisions. The appointment will be subject to a probationary period of six months.

Abridged conditions of service may be obtained from the Commissioner for Northern Rhodesia, 57, Haymarket, London, S.W.1, to whom applications, in duplicate, on the lines of the application form for appointments used by the Central Electricity Generating Board, accompanied by a recent medical certificate of fitness and copies of three recent testimonials, should be sent to arrive not later than 14th September, 1959.

Canvassing of councillors will disqualify candidates for appointment, and candidates must disclose whether they are related to any members or officers of the Council.

H. T. R. MORGAN,
P.O. Box 29, Town Clerk.
Livingstone, N.R.
30th July, 1959. 1203

## BORD NA MONA

### Vacancy for Junior Electrical Engineer

A VACANCY exists for a JUNIOR ELECTRICAL ENGINEER on a salary scale of £626/£30/£1,076. Applicants must possess technical qualifications up to A.M.I.E.E. standard and should preferably have some industrial experience.

Applications stating age, qualifications and experience should reach the Secretary, Bord Na Mona, 28, Upper Pembroke Street, Dublin, not later than Saturday, 29th August, 1959. 1284

## PROJECT DEVELOPMENT ENGINEERS

A WELL-established and expanding company (S.E. London) invites applications from young progressive engineers keen to carry through, from the design stage to production, light electro-mechanical equipment for quantity manufacture. Experience in electro-magnetics and small motor design essential.

Salaries commensurate with age and experience.

Reply fully stating age, experience and salary required. No disclosure of applications without agreement.—Box 1078.

## MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts :—

**North Staffs Sub-Area**

SECOND ASSISTANT DISTRICT ENGINEER (Stoke Central District).

Duties will include assistance in the construction, operation and maintenance of H.V. and M.V. overhead and underground mains and substations, and in the planning of system reinforcement and extensions. Technical qualifications desirable. Salary £910/£955 per annum (N.J.B. Grade F.7).

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. C. C. Pimble, Sub-Area Manager, Midlands Electricity Board, P.O. Box No. 4, 234, Victoria Road, Fenton, Stoke-on-Trent.

**Worcester and District Sub-Area**

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER (Evesham District).

Applicants should have had a sound technical training and a wide practical experience in electrical contracting and the installation of domestic, commercial and farming electrical equipment. Duties will be chiefly in connection with contracting, street lighting, refrigeration and supervision of the radio and television section. Technical qualifications desirable. Salary £965/£1,025 per annum (N.J.B. Grade F.6).

Apply by letter, within 14 days, stating age, qualifications, experience, present position and salary to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Blackpole Road, Worcester.

A. STEPHENS,
Secretary. 1206

**MSL** have been retained to advise on the appointment of a

## GENERAL MANAGER

for a company in South Africa backed by a large home group and manufacturing and selling medium and heavy electrical equipment to the principal users in the country. He will be responsible to the local group managing director and will be expected materially to increase the present seven-figure turnover. The facilities for doing so exist.

Candidates, who may be 40-50, should be qualified mechanical, electrical or production engineers and should have followed a straightforward career preferably in the electrical manufacturing industry, after a recognised apprenticeship. They should have had several years in a senior executive position and be experienced in modern methods of factory administration. The successful applicant will be expected to make his home in South Africa.

A commencing salary of £3,000 is envisaged with first class outward passages, car, pension scheme, and assistance with house purchase if required.

Please send brief details in confidence, quoting reference M.1761 to A. Shaw Maclaren.

**MANAGEMENT SELECTION LIMITED**
**17, Stratton Street, London, W.1**

1225

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECOND ASSISTANT COMMERCIAL ENGINEER (Industrial Development) required at No. 1 Sub-Area Headquarters, 24, Hatton Garden, Liverpool, 3. Salary within range £1,270/£1,360 per annum (N.J.B. L/7).

Applicants should have experience in the electricity supply industry, and be capable of advising on major industrial supplies.

Duties will include development of industrial applications of electricity, preparation of estimates for contracting works. Suitable technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Special application forms obtainable from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3. Closing date, 3rd September, 1959. 1260

## ELECTRICITY CORPORATION OF NIGERIA

### Appointment of Assistant General Manager (Administration)

APPLICATIONS are invited from suitably qualified Nigerians for appointment to the post of ASSISTANT GENERAL MANAGER (Administration).

The duties attaching to this appointment comprise general responsibility to the Chief Executive Officer and General Manager for the administrative aspects of the Corporation's organisation, and in particular for the formulation and direction of personnel and labour policy. (The Corporation employs a Personnel Manager.)

The officer appointed will be required to reside in Lagos and to take up his duties at Electricity Headquarters in Lagos, but will be required to tour throughout Nigeria on occasion.

Candidates should possess an engineering qualification (which need not be electrical) and should have had administrative experience in a public corporation or large commercial organisation.

The salary attached to this appointment is £3,050 p.a. (consolidated). A house equipped with heavy furniture will be provided at an annual rent of £150 p.a.

The appointment is pensionable in accordance with the Corporation's superannuation scheme and will also be subject to the general conditions of service applicable from time to time. There are very good prospects of promotion for a suitable candidate.

Requests for the necessary form of application should be addressed to :—

The Resident Engineer,
Nigeria House,
9, Northumberland Avenue,
London, W.C.2,

and should be enclosed in an envelope endorsed "Confidential — Appointment of Assistant General Manager (Administration)." Completed application forms must be received at the office of the Resident Engineer not later than 10th September, 1959.

ARTHUR FAUL,
Secretary to the Corporation.

1222

## EASTERN ELECTRICITY BOARD

### Norfolk Sub-Area

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

NORWICH DISTRICT
(162/59.N)

ASSISTANT ENGINEER (Commercial). Applicants should have had experience of industrial power application and negotiations with industrial consumers. The duties of the post will be particularly concerned with the D.C./A.C. changeover in the District.

Salary N.J.B. Class G, Grade 11 (£765-£810).

Apply by letter to the Manager, Norwich District, Eastern Electricity Board, 4, Duke Street, Norwich, by 4th September, 1959.

SUB-AREA HEADQUARTERS,
NORWICH (163/59.R)

FOURTH ASSISTANT ENGINEER (Planning and Development). Applicants should have had a sound technical training and preferably some experience in the planning, construction, operation or maintenance of H.V. and L.V. distribution systems.

Salary N.J.B. Class K, Grade 13 (£815-£860).

Apply by letter to the Manager, Norfolk Sub-Area, Eastern Electricity Board, 4, Duke Street, Norwich, by 4th September, 1959. 1289

RESISTANCE WELDING ENGINEER REQUIRED. EXPERIENCED IN DESIGN AND APPLICATION OF SPOT, SEAM AND PROJECTION WELDERS.

APPLY, GIVING FULL PARTICULARS, INCLUDING EXPERIENCE AND SALARY REQUIRED, TO—

THE TECHNICAL DIRECTOR
SIEMENS-SCHUCKERT
(GREAT BRITAIN) LIMITED
GREAT WEST ROAD
BRENTFORD, MIDDX

1207

## CENTRAL ELECTRICITY GENERATING BOARD

### Southern Project Group

ASSISTANT ELECTRICAL ENGINEER, BERKELEY NUCLEAR POWER STATION

APPLICATIONS are invited for the above appointment at Berkeley (Gloucestershire) Nuclear Power Station Construction Site.

The successful candidate will be required to assist the Site Electrical Engineers in the inspection of the installation and the testing of electrical engineering plant in connection with both conventional and nuclear plant. Experience on a power station construction site or of the installation of major electrical engineering works would be an advantage.

Salary in range £1,090-£1,300 per annum, in accordance with Schedule C, Grade 5 of the N.J.B. Agreement.

Applicants should have some works experience or apprenticeship and have qualifications preferably up to the Higher National Certificate.

The successful candidate would be expected to live in the vicinity of the site for the duration of the construction work, which will be approximately an eighteen-month to two-year period.

Opportunities will be available for transfer to future power station sites and to design teams associated with these stations.

Applications stating age, qualifications, experience, present position and salary should be forwarded to the Administrative Officer, Central Electricity Generating Board, Southern Project Group, Squires Lane, Finchley, London, N.3, to arrive not later than 1st September, 1959.

Envelopes should be marked "Confidential—Ref. S/59/28." 1267

ELECTRO METHODS LTD OF STEVENAGE

require

TRANSFORMER ENGINEER

ARE you interested in applying the experience you have gained in transformer design to the development of transductors for use as magnetic amplifiers and saturable reactors?

Expansion of our Industrial Control Division has created this vacancy. Applicants should be experienced transformer designers possessing either an Honours Degree or H.N.C.

A starting salary of up to £1,000 p.a. is offered for this position.

Housing available in the New Town of Stevenage. Pension scheme, canteen and recreational facilities.

Applications to be made in writing only to the Personnel Manager, Electro Methods Ltd., Caxton Way, Stevenage, Herts.

1230

## NORTH EASTERN ELECTRICITY BOARD

### Harrogate Sub-Area

APPLICATIONS are invited for the following appointments :—

(i) SECOND ASSISTANT DISTRICT ENGINEER, Thirsk District.

(ii) SECOND ASSISTANT DISTRICT ENGINEER, Northallerton District.

Applicants should have had experience in construction, operation and maintenance of H.V. and L.V. systems. Salary Schedule A, Class D, Grade 7, £815/£860. N.J.B. conditions of contract.

Applications, stating age, qualifications and experience, to be received by the Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 1229

## CENTRAL ELECTRICITY GENERATING BOARD

### South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. appointments in this Division :—

ASSISTANT ENGINEER (Combustion),
UPPER BOAT POWER STATION
(Near Pontypridd)
(Vacancy No. 145/ER/59).
Salary H.9, £910-£955 per annum.

Applicants should possess H.N.C. or equivalent qualifications. Previous experience of the economical operation of turbines, pulverised fuel and stoker-fired boilers desirable. Experience of boiler instrumentation an advantage.

MAINTENANCE ENGINEER (Mechanical)
(Vacancy No. 146/ER/59).

MAINTENANCE ENGINEER (Electrical)
(Vacancy No. 147/ER/59).
ABERTHAW POWER STATION.
Salary L.6, £1,360-£1,450 per annum.

Applicants should have had experience of power station maintenance and should preferably be Corporate Members of the Institution of Mechanical/Electrical Engineers.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 31st August, 1959. 1290

## BIRMINGHAM TAME AND REA DISTRICT DRAINAGE BOARD

### Engineer's Staff: Electrical Assistant

APPLICATIONS are invited for the undermentioned temporary appointment on the staff of the Engineer to the Board, Rookery Park, Erdington, Birmingham, 24, and the post is subject to one month's notice on either side, the passing of a medical examination, and the provisions of the Local Government Superannuation Acts. There is a possibility of housing being made available. Previous local authority experience is not necessary.

ELECTRICAL ASSISTANT. Temporary post at a commencing salary within A.P.T. Grade III (£880 × £35 × £40 × £35 (2) × £40 to £1,065). Applicants should have Higher National Certificate in Electrical Engineering or similar qualifications and must have drawing office experience in the preparation of specifications, plans, estimates and the installation and maintenance of modern industrial and pumping plant up to 3.3 kV.

Applications, accompanied by the names of three referees, and giving particulars of age, qualifications and experience, should reach the undersigned not later than Monday, 14th September, 1959.

ARTHUR J. WRIGHT,
Clerk to the Board.
Clerk's Office,
Lombard House,
Great Charles Street,
Birmingham, 3. 1248

## COUNTY BOROUGH OF CROYDON

### Electrical Engineering Assistant

APPLICATIONS are invited from persons who have passed the final examination of the Institution of Electrical Engineers (or equivalent) for this superannuable appointment in the Borough Engineer's Department.

Duties mainly preparation of specifications for street lighting schemes and supervision of the installation, but applicants should also have experience in preparing specifications for electrical installations in various types of buildings.

Salary scale £1,085 to £1,250 p.a., commencing at any point within the scale according to experience.

Write to Borough Engineer, Town Hall, Croydon, for further particulars and application form, mentioning this journal.

E. TABERNER,
Town Clerk. 1263

## ELECTRICAL SALES ENGINEERS

### Bruce Peebles & Co. Limited, East Pilton, Edinburgh, 5

require ENGINEERS of H.N.C. standard for their Transformer Sales and Contracts Department. 5-day week. Staff pension and bonus schemes. Housing assistance given if necessary.

Apply, giving details of experience, to the Divisional Director (Transformers) at the above address. 1208

*Situations Vacant (continued)*

## SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT COMMERCIAL ENGINEER, Croydon and Purley District.

Salary £910 × £15 to £955 per annum, including London Area allowance under N.J.B. Schedule A, Grade J/11. Applicants should be experienced in the planning, preparation of specifications and supervision of rising mains and internal distribution in multi-storey buildings. They should also be capable of calculating heat loss data of buildings for floor warming installations.

Applications, quoting TER, and naming two referees, on forms from District Manager SEEBOARD, Electric House, Wellesley Road, Croydon, by 2nd September, 1959.

DISTRICT COMMERCIAL ASSISTANT, Croydon and Purley District.

Salary £760 × £20 to £820 per annum, including London Area allowance under N.J.C. Grade 3. Applicants should be fully experienced in and able to advise on all supply matters including tariffs, sales and quotations for domestic, commercial and industrial electrical installations. A knowledge of space heating, particularly as applied to off-peak loads, is essential.

Applications, quoting TER, and naming two referees, on forms from District Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 2nd September, 1959.

GEORGE WRAY,
Secretary. 1285

## CENTRAL ELECTRICITY GENERATING BOARD

### North Eastern Division

FOURTH ASSISTANT ENGINEERS, Technical Department (Protective Gear and Electrical Plant Testing Section).

Applications are invited for the above-mentioned appointments with headquarters at Newcastle upon Tyne.

Applicants should have had experience in the layout of electrical control and protective gear, including the preparation of circuit diagrams.

Applicants should possess technical qualifications of Graduate I.E.E. standard, and experience in a manufacturers' works would also be considered an advantage.

The salary for the appointments (which are superannuable) will be in accordance with the National Joint Board Agreement, Schedule B, Grade 7 (£840-£1,040 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from any office of the Board or from Divisional Establishments Officer, Central Electricity Generating Board, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 1st September, 1959. 1197

## INSIDE SALES AND APPLICATIONS ENGINEERS

ENGINEERS possessing O.N.C. or H.N.C. with experience in one of the following—

(a) Control gear
(b) Variable speed drives
(c) Power rectifiers

are offered a unique opportunity to widen their interests by obtaining experience in all of these fields.

Reply in confidence, giving details of age, experience and salary required, quoting reference VWP.

**LANCASHIRE DYNAMO NEVELIN LIMITED**
**Hurst Green, Oxted, Surrey**
1198

## STAFF REQUIRED FOR WIRE ENAMELLING PLANT

APPLICATIONS are invited from personnel engaged in the wire enamelling industry. Vacancies exist for engineering, laboratory and foreman grade production and maintenance staff.

Existing staff have been advised of these vacancies. Write—Box 1269.

## NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

### Dundee Area

APPLICATIONS are invited for the undernoted superannuable position in the Dundee Area :—

DISTRICT COMMERCIAL ASSISTANT (Montrose).

Candidates should be suitably qualified to advise consumers upon tariffs, conditions of supply, and domestic, commercial and agricultural equipment; selling ability is also essential.

The successful candidate will require to reside in Montrose.

Salary N.J.C. Grade 2 (£640 × £20 to £700) or Grade 3, £720 × £20 to £780) according to qualifications, etc.

Applications should be addressed to the Area Manager, Dudhope Crescent Road, Dundee, and should reach this office not later than Saturday, 5th September, 1959.

R. B. ANDERSON,
Area Manager.

Dudhope Crescent Road,
Dundee. 1275

## SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable appointment in the Distribution/Construction Section of the Chief Engineer's Department at Board Headquarters, Glasgow :—

THIRD ASSISTANT ENGINEER (Electrical).

Candidates should possess a Degree or Higher National Certificate in Electrical Engineering and should have experience in the design and construction of indoor and outdoor substations for operation at voltages up to 33 kV and the handling of contracts for switchgear up to 33 kV. Some experience of 33-kV transformer contracts would be an advantage.

Salary £1,090/£1,355 per annum, on Class AX/DX, Grade 5 of Schedule B to the National Joint Board Agreement.

Apply, quoting reference number E.27/59 on form AE.6, available from the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, not later than 31st August, 1959. 1264

## LONDON ELECTRICITY BOARD

### Assistant Distribution Engineers

APPLICANTS should have had a sound technical education to at least Higher National Certificate standard, preferably being Corporate Members of the I.E.E., and possess practical experience of all branches of engineering work associated with the organisation of a District distribution department.

The posts are graded under Schedule A of the National Joint Board Agreement, and the salaries are inclusive of London allowance.

Vacancies exist as follows :—

CENTRAL DISTRICT
(based in the City area):
Class J, Grade 10, £960/£1,005 p.a.

EASTERN DISTRICT
(based at Stratford, E.15):
Class J, Grade 12, £865/£910 p.a.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 31st August, 1959. Please indicate District preferred and quote ref. PER/2715/R. 1261

## EXPERIENCED PRODUCTION ENGINEER

A WELL-established and expanding company with factories in S.E. London, producing small electrical equipment for a wide market in both long and short runs, has a vacancy for an experienced and qualified engineer to be directly responsible to the Engineering Director for the Production Engineering Department. Recent experience must cover modern light engineering practice and all phases of engineering office organisation, including estimating, machine and assembly planning. Emphasis upon production tool design and special-purpose machines is desirable.

Salary will be according to qualifications and experience. No disclosure of application will be made without agreement.

Applicants between 35 and 45 years only.
Reply to—Box 1079.

## CROMPTON PARKINSON LIMITED

require another

TECHNICAL EDITORIAL WRITER

for the preparation of press releases and associated press liaison duties. Essential qualifications include good versatile writing ability, a "news sense" and a background knowledge of, in particular, electrical engineering and industrial subjects.

The position is centred in London and entails occasional travelling in the U.K.

Applicants should write giving details of career, age and salary required to :—

**The Chief Personnel Officer**
**CROMPTON PARKINSON LIMITED**
**Crompton House**
**Aldwych, London, W.C.2**
1271

## CENTRAL ELECTRICITY GENERATING BOARD

### South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. appointments at Carmarthen Bay Power Station :—

ASSISTANT MAINTENANCE ENGINEER (Electrical)
(Vacancy No. 140/ER/59).

ASSISTANT MAINTENANCE ENGINEER (Mechanical)
(Vacancy No. 141/ER/59).

Salary K.8, £1,095-£1,170 per annum.

Applicants should have had wide experience in power station maintenance and should preferably be Corporate Members of the Institution of Electrical/Mechanical Engineers or hold equivalent qualifications.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 31st August, 1959. 1257

## CITY OF CARDIFF

APPLICATIONS are invited for the following vacant position in the City Surveyor's Department.

ENGINEERING DRAUGHTSMAN, A.P.T. Division, Grade 2 (£765-£880 per annum).

Candidates should possess the minimum qualifications and experience prescribed by the National Joint Council for Local Authorities' Administrative, Professional, Technical and Clerical Services for posts in the above mentioned Grade. Preference will be given to applicants with a knowledge of heating, ventilating and electrical engineering drawings.

General conditions of appointment may be obtained from the undersigned.

Applications stating age, experience and qualifications in an envelope endorsed "Engineering Draughtsman," together with the names and addresses of three referees, should be received by me not later than the 31st August, 1959.

S. TAPPER-JONES,
Town Clerk. 1288

## ASSISTANT CHIEF ELECTRICAL ENGINEER

required for large coal mining organisation near Concepcion, Chile. Applicant, preferably about 35 years of age, must have wide experience of planning and maintenance of mining equipment and of the application of planned maintenance schemes. He will be required to take charge of all mechanical and electrical underground installations.

As one qualification the engineer must possess A.M.I.E.E. Definite prospects for future advancement.

Request for application form to :—

**The Chief Engineer**
**Powell Duffryn Technical Services Limited**
**19, Berkeley Street, London, W.1**
1186

### NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

**North Caledonia Area**

THIRD ASSISTANT ENGINEER
(Planning)

APPLICATIONS are invited for the above superannuable post at the Area Office, Elgin, Morayshire. Elgin enjoys a mild, healthy climate, and is four miles from the coast.

The successful candidate will be required to assist in the planning of city, urban and rural networks. Operation and construction experience is desirable. Qualifications, Higher National Certificate in Electrical Engineering would be an advantage. Salary and conditions of service in accordance with National Joint Board Agreement. Class G, Grade 9, £860 × £15-£905 per annum.

Applications should be made on a form to be obtained from the Manager at the address below to whom it should be returned not later than 4th September, 1959.

A. MENZIES,
Manager.

West Villa,
South Street,
Elgin. 1291

### MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER required in the Planning Section of the Chief Engineer's Department at Board Headquarters, Love Lane, Pall Mall, Liverpool, 3.

Initial salary within range £925/£1,140 per annum (N.J.B. Schedule C/AX/DX.6).

Applicants should have a thorough technical training, be suitably qualified, and have knowledge of the economic factors governing the design and planning of distribution networks.

Appointment subject to medical examination. Pension scheme.

Applications should be made on forms obtainable from the Establishments Officer at the above address. Closing date 3rd September, 1959. 1202

### CEYLON

A VERY attractive salary will be paid to successful applicant for position as SENIOR ELECTRICAL ENGINEER in British-managed Colombo firm.

Job calls for sound administrative ability including control of local staff, plus wide knowledge all branches electrical contracting and engineering. Commercial and sales experience and knowledge of Government liaison essential.

Applications in strictest confidence to Box P.211, W.P.S., Thavies Inn House, Holborn Circus, London, E.C.1.

1212

### ADMIRALTY

DRAUGHTSMAN required for Aircraft Department, London. Must be British subject, aged 21 or over, with 5 years' apprenticeship, or equivalent, in electrical engineering, a broad knowledge of aircraft electrical, radio and/or instrument installations, and some drawing office experience. Service in Air Electrical Branch of R.N. or R.A.F. would be valuable. Five-day week, eighteen days annual leave.

Salary in the range £570 (age 21) to £785 on entry, rising to £900 (inclusive of London weighting addition).

Applications, with full personal details, to Secretary of the Admiralty, C.E.II(114), Empire Hotel, Bath. 1256

### FREDERICK S. SNOW & PARTNERS

require

ELECTRICAL ENGINEERING ASSISTANTS

for design, specification and detailing of power distribution, electrical installations, comprising heating, lighting and power in industrial and commercial buildings.

JUNIOR AND INTERMEDIATE GRADES to National Certificate standard or equivalent.

Write stating age, experience and salary required to :—

**Monro Building**
**Wellington Street, London, W.C.2**

1221

### MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required at Llanberis. Salary within the range £765/£810 per annum (N.J.B. E.9).

Applicants should preferably have had experience in the construction, operation and maintenance of overhead and underground high and medium voltage networks with their associated substations and equipment.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Rhostyllen, near Wrexham.

Closing date 3rd September, 1959. 1280

## ELECTRICAL ENGINEER

APPLICATIONS from men aged 27 to 35 are invited for post of Assistant to the Senior Electrical Engineer in a large manufacturing company. The work will embrace all facets of design, planning, installation, inspection and commissioning.

Applicants should be Corporate Members of the I.E.E. and have had a very thorough experience with a manufacturing organisation or an electricity board.

The starting salary will be within the £1,000-£1,150 bracket.

Housing facilities are available and assistance may be given with removal expenses. There is a superannuation and insurance scheme.

Apply—Box 1303.

### CITY OF LEICESTER

PUBLIC LIGHTING SENIOR ASSISTANT required for interesting work in connection with varied development and improvement programme of street lighting. Commencing salary within range £785 to £1,070 p.a. according to qualifications and experience. Permanent and pensionable post. Housing accommodation available if required. Institution of Electrical Engineers, Illuminating Engineering Society or H.N.C. qualifications required.

Applications giving names of two referees should reach City Surveyor, Town Hall, Leicester, within 10 days of appearance of this advertisement. 1138

### DEMERARA ELECTRIC CO. LTD.

**Georgetown, British Guiana**

APPLICATIONS are invited for the post of ASSISTANT ELECTRICAL SUPERINTENDENT from engineers with H.N.C. qualification and age limits of 25 to 35. The company is expanding and applicants should have considerable experience of the work of an electricity undertaking, particularly in respect of switchgear installation and distribution.

Replies stating age, marital status, training and subsequent experience, etc., should be sent to Messrs. Mackness & Shipley, Consulting Engineers, Parliament Mansions, Abbey Orchard Street, London, S.W.1, quoting reference 2452. 1105

### ELECTRICAL ENGINEERS

required in Chartered Architects' Engineering Department for interesting design work on installations for all types of buildings.

(a) SENIOR ENGINEERS, preferably A.M.I.E.E., to assume responsibility for schemes. Salaries up to £1,400 per annum.

(b) INTERMEDIATE ENGINEERS, preferably Grad. I.E.E., and Junior Engineers. Salary range £650 to £950 per annum.

Non-contributory pension and life assurance schemes.

Apply, stating age, qualifications and experience, to J. G. L. Poulson, Chartered Architects, 29, Ropergate, Pontefract, Yorkshire. 1235

### H. CLARKE & COMPANY LIMITED

**Patricroft, Manchester**

require a SALES REPRESENTATIVE in the Birmingham and Midlands area. Knowledge of the electrical insulating industry and materials desirable. The post is permanent and offers good opportunities to the right man.

Applications will be treated in strictest confidence, and should be addressed to the Managing Director. 1175

### LONDON ELECTRICITY BOARD

**Senior Draughtsman**

APPLICATIONS are invited for the above position in the Board's Southern District in the Camberwell/Brixton area.

Candidates should have had a good general education and possess the Ordinary National Certificate in Building or its equivalent, and be capable of supervising engineering draughtsmen and other drawing office staff.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 5 (£830 to £940 per annum) inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed within fourteen days from the publication date of this advertisement. Please quote ref. PER/2694/R. 1143

### MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required in the Liverpool North District. Salary within range £965/£1,025 per annum (N.J.B. J/9).

Applicants should have had technical training and had operational experience of H.V. and L.V. networks, including substations. Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Special application forms obtainable from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, should be returned not later than 1st September, 1959. 1281

### BRUCE PEEBLES & CO. LIMITED

have a vacancy for a TECHNICAL SALES ENGINEER in their Rotating Plant Sales Department. Five-day week, staff pension scheme, assistance with removal expenses and house purchase where necessary.

Applications stating age, qualifications and experience to Divisional Director (Rotating Plant), Bruce Peebles & Co. Limited, East Pilton, Edinburgh, 5. 1283

A LEADING company of electrical contractors have a number of vacancies for estimating engineers in the estimating department at their head office in Westminster. There is a bonus scheme in operaion for all, and a non-contributory pension scheme for persons under the age of fifty years when joining the company. Engineers capable of estimating for all types of electrical installation contracts should apply giving details of experience, age and present salary, to—Box 1050.

AN engineering insurance company requires an engineer for appointment as inspecting engineer of electrical plant. Candidates must possess H.N.C. in Electrical Engineering or equivalent and have served an apprenticeship with a manufacturer of electrical machinery. Apply in own handwriting to The National Boiler & General Insurance Co. Ltd., St. Mary's Parsonage, Manchester, 3, giving age (limits 26 to 33), training and experience, academic qualifications and copies of testimonials. Salary £800-£1,100 progressive. Non-contributory pension scheme. 1056

APPRENTICE master (electrical) required by Uganda Government Public Works Department on contract for tour of 30-36 months in first instance. Salary according to experience in scale (including inducement addition) £813 rising to £1,341 a year. Gratuity at rate of 13½% total salary drawn. Outfit allowance £30. Free passages. Liberal leave on full salary. Candidates should be under 45 years of age. They should have served 5 years' apprenticeship as electrician and have O.N.C. (Electrical) and should have at least 5 years' experience in maintenance and installation of electrical equipment and all classes of wiring work and at least 5 years' experience in training apprentices in a large organisation. Possession of H.N.C. (Electrical) an additional advantage. Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/50710/LF. 1296

ASSISTANT electrical engineer required for iron and steel works. Age 25-30. Minimum technical qualification H.N.C. Recognised apprenticeship with large electrical manufacturer. Salary £900-£1,000 per annum depending on experience.—Box 1169.

***Situations Vacant** (continued)*

APPLICATIONS invited from engineers for supervision of overhead transmission line construction (all voltages) in Pakistan. Some underground cable experience desirable. Applicants will also be considered for home contracts. Write giving particulars of training and experience to Contract Manager, W. T. Henley's Telegraph Works Co. Ltd., 59/62, High Holborn, London, W.C.1. 964

ASSISTANT estimating and supervising engineer required for London office. Applicants should have experience in the preparation of tenders and setting out of work from design stage to completion. Write stating age, experience, etc., and salary required to Phoenix Electrical Co. (London) Ltd., Phoenix House, 16-18, Marshalsea Road, London, S.E.1. 1194

BP requires an electrical engineer for service in West Africa. Applicants, aged 25-35, must hold a H.N.C. at least, should have completed a full apprenticeship and have had at least five years' practical experience in general installations. Experience on bulk air-conditioning plant and a general knowledge of flameproof electrical equipment would be valuable. Salary according to age and experience, kit allowance, pension scheme, good leave arrangements, free medical attention, free passage out and home. Write, giving full details of qualifications and previous experience, quoting reference F.573, to—Box 3171, c/o 191, Gresham House, London, E.C.2. 1295

CONTROL gear engineer with manufacturing or industrial experience in application of contactors and relays. Must have sound electrical training and at least H.N.C. An interesting job with good prospects for man of initiative and suitable experience. Four-figure salary according to age and qualifications. Pension scheme, canteen, 5-day week. Write giving full details of age, experience and present salary, to —Managing Director, E. N. Bray Ltd., Britannia Road, Waltham Cross. 1027

COSTING engineer required at the London factory of electric lamp manufacturers; previous experience an asset but not essential. The position holds excellent prospects for the right man and is permanent and pensionable. Applicants should give details as to age, previous experience and salary required, which will be treated with full confidence.—Box 1161.

DESIGN office requires young engineer for work on rectifiers and transformers. National Certificate 3rd or 4th year standard preferred. Apply, stating qualifications and experience, to Secretary, Lancashire Dynamo Nevelin Ltd., Hurst Green, Oxted, Surrey. 1024a

DESIGNER, draughtsman-designer or development engineer required by leading manufacturers of industrial fuse and switchgear to develop a range of air circuit-breakers, initially 500/2,000 amps, 415 volts. Opportunity for keen man to develop and manage new department in this field. State experience, present salary, etc.—Box 1162.

DRAUGHTSMAN required for control gear design section. Experience in design of electro-magnetic devices and sheet steel enclosures desirable. 5-day week, pension scheme, canteen. Write giving full details of age, experience and salary, to—Chief Engineer, E. N. Bray Ltd., Britannia Road, Waltham Cross. 1028

DRAUGHTSMAN required for mechanical design of contactors, relays and switch mechanisms, as used in industrial electric control gear. Must be familiar with modern production methods, and able, without continuous supervision, to design parts for economical manufacture and assembly. Pension and bonus schemes in operation. Applicants having suitable experience are invited to write, giving all essental details, to the Secretary, Morecambe Electrical Equipment Co. Ltd., Westgate Works, Morecambe, Lancashire. 1058

DRAUGHTSMEN for electrical control gear design and detail required by Morecambe Electrical Equipment Co. Ltd. Salary not less than A.E.S.D. minimum. Pension and bonus schemes in operation. Experienced or suitably qualified men are invited to apply, giving full details, to Mr. C. Morrey, Westgate Works, Morecambe. 1057

DRAUGHTSMEN required for production drawing office of manufacturers of medium voltage switchgear and control gear. Congenial conditions, canteen facilities and social club. Apply Secretary, Lancashire Dynamo Nevelin Ltd., Hurst Green, Oxted, Surrey. 1023

EKCO ENSIGN ELECTRIC Ltd. require trained or partly trained lighting engineers for London office. Apply Senior Lighting Engineer, 45, Essex Street, London, W.C.2. 1193

ELECTRICAL contractors require costing clerk with some knowledge of trade and ability at figures. Write details of experience to Phœnix Electrical Co. (Ldn.) Ltd., Marshalsea Road, London, S.E.1. 1297

ELECTRICAL contractors require installations engineer for service in Ghana. 18 months' tour, 3 months' leave plus allowances. —Marryat & Place Ltd., 40, Hatton Garden London, E.C.1. 1144

ELECTRICAL control gear manufacturers require a senior sales representative for Birmingham area. Practical experience of control gear and electrical training essential. A period of training will be given at works. Salary and expenses, pension scheme, car provided. State age, experience and salary required to Sales Manager.—Box 1029.

ELECTRICAL designer required for design and development of specialised rotary electrical equipment up to 25 kW. Applicants should have had considerable design experience and preferably have already held a senior staff post. A pension scheme is in operation. Please write giving full particulars and salary required to—Box 1213.

ELECTRICAL engineer required by London consulting engineers for preparation of design, specifications, etc., for schools, hospitals and commercial buildings, etc. Write stating age, experience, qualifications and salary required to—Box 160.

ELECTRICAL heating engineer. A senior appointment in the company's cable divn. is under consideration in a section concerned with the design of electrical space heating systems and allied applications. This would be an excellent opportunity for a qualified electrical engineer able to take a lead in the development of new projects and interested in achieving practical results. Candidates should preferably be Members of Inst. of Heating and Ventilating Engrs. Practical experience of electric floor warming in particular will be an advantage. The appointment would be at our Woolwich works. The company is a member of the A.E.I. group and a good salary and attractive conditions are offered, including pension scheme. Please write with a brief description of age, qualifications and experience to Staff Officer, Ref. 744/75ER, Siemens Edison Swan Ltd., London, S.E.18. 1215

ELECTRICAL installation contractors, London, require first-class senior supervising engineer. Applicants must have held similar position over number of years. Good salary and prospects. Pension scheme. Give details of past and present employment which will be treated in strict confidence.—Box 9775.

ELECTRICIAN required as working chargehand. Most interesting work on new machinery; some factory maintenance. Electronics valuable but not essential. Pension scheme. Age mid thirties. S.W. London. Write full details in confidence.—Box 1228.

ELECTRICIAN required for engineer's department, experienced in general installation, power and maintenance work; experience in power-operated lifts advantageous. Electrical contracting industry N.J.I.C. conditions and a 44-hour week. Write for application form to Chief Engineer, King's College Hospital, Denmark Hill, London, S.E.5. 1242

ELECTRICIANS required for maintenance and development in large factory (Cardiff area). Must include H.T. A.C. and D.C. motors, auto-control gear and instrumentation. Permanent position.—Box 1216.

ENGINEER-surveyor required by insurance company for inspections of all types of electrical plant in Glasgow and surrounding areas. Applicants should hold Higher National Certificate, have served apprenticeship and have had wide subsequent experience. Permanent position with progressive salary scale commencing at £800 per annum plus expenses and allowances; non-contributory pension scheme. Age not over 35. Apply—Box 1239.

ENGINEER-surveyor required for inspection of cranes and other lifting plant. Must have drawing office experience in design of cranes and National Certificate in Mechanical Engineering. Resident south preferably near London for relief work. Commencing salary £800 rising to £1,100 (E.S.A. scale). Pension and other benefits. Apply—Eng. Dept., General Assurance Corp., 99, Aldwych, London, W.C.2. 1252

ENGINEER to supervise the estimation and design of electric control panels. Scope for development and introduction of new ideas in a progressive company situated near London. Applicants must be capable of taking complete charge of small unit within a large organisation and should possess O.N.C., but preferably H.N.C. (Elect.), and have experience of supervision of estimators and draughtsmen. Salary £1,200. Apply—Box 1214.

ENGINEERING company in West Africa importing electrical machinery and equipment manufactured by firm of world-wide repute requires an engineer capable of developing the sales of these products in a rapidly expanding market. Applicants, who should be under 35, must have had experience in the selling field backed by a wide practical experience. Qualifications should be at least to H.N.C. Commencing salary will be £1,200 per annum or more depending on qualifications. In addition there are family allowances, free furnished accommodation, free passages to and from Africa, and free medical attention in Africa. Tours are about 21 months followed by substantial leave on full pay. Membership of pension fund. Apply giving full details of experience and qualifications to—Box 1293.

ESTIMATING and sales engineer for London office of leading manufacturers of electric motors and generators. Pension scheme and opportunities of promotion for young man with the right personality and qualifications. Write in confidence giving full details of age, education, training, experience and salary required, to—Box 1115.

ESTIMATING engineer required for electrical contractors Wolverhampton area. Must be used to taking off quantities and supervising jobs to very high standards. Please write stating age and experience and salary required. Good prospects with progressive company.—Box 1253.

FOREMAN armature winder wanted with repair shop experience.—Dow & Nicholson Ltd., 10, Wellington Place, Aberdeen. 1245

FOSTER TRANSFORMERS Ltd., South Wimbledon, London, S.W.19, have vacancies for testers for work on all types of transformers up to 3,000 kVA. Applicants should have had some training or experience in the electrical industry. Apply in first instance giving details of experience and salary required to the Personnel Officer. 1062

FOSTER TRANSFORMERS Ltd., South Wimbledon, London, S.W.19, require a technical sales assistant to deal with specifications and correspondence, etc. Minimum qualifications required O.N.C. or equivalent and experience in transformer work. Apply in writing to the Personnel Officer, stating age, qualifications and previous experience. 1195

JUNIOR electrical engineer required by consulting engineers in London (West End). Good opportunity for engineer wishing to transfer from contracting.—Box 1095.

JUNIOR technical estimator required for work on electrical control equipment projects. Must have electrical training to O.N.C. standard and have some knowledge of electric motors and associate control equipment. 5-day week, canteen facilities, pension fund, etc. Please write giving details of age, experience, qualifications and salary required to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow. 965

JUNIOR technical sales engineer for transformer sales dept. Work mainly concerned with on-load tap changers with particular reference to operation control circuits. Apply giving details of qualifications, experience and present salary to Personnel Officer, Fuller Electric Ltd., Fulbourne Road, London, E.17. 1192

LARGE London West End electrical contractors require a sales representative. Applicants must have contacts with leading consultants, architects, etc. Full particulars and salary required in confidence to—Box 1000.

LIGHTING fitting representative required for the Lancashire area, to call on wholesalers, contractors, public authorities and large users. Excellent prospects for progressive sales of new lighting products backed by good design and lighting engineers. Remuneration by basic wage and commission realising 4-figure salary. Must be car owner. Allowance provided. Write stating age, details of sales experience and any relevant information to—Box 1190.

LIFT servicing engineers required. Must have good knowledge of electric lifts. Apply in writing to—Marryat & Place Ltd., 40, Hatton Garden, London, E.C.1. 1231

MAJOR petroleum distribution company require for their London office a fully experienced electrical engineer for the development of new projects and the maintenance of existing electrical installations. Applicants preferably should have experience in flameproof construction, be familiar with codes of practice relative thereto, and be well versed in the technical supervision of contracted work. Starting salary commensurate with qualifications and experience. Excellent pension scheme. Apply giving full details of age, qualifications and experience to Box 1080. Replies can only be sent to those selected for interview.

MEDIUM size manufacturers of electrical equipment requires designs engineer for the manufacture of capacitors for use on power systems. Write giving age, experience and salary required to—Box 1060.

MEDIUM size manufacturers of electrical equipment requires designs engineer for the manufacture of medium-voltage contactors. Write giving age, experience and salary required to—Box 1059.

METHODS engineer, electrical, required for established diesel manufacturing company in East Anglia. Applicants should be fully qualified electrical engineers with first-class knowledge of modern electrical equipment and test bed procedures. Ability and personality to organise and take full responsibility for test problems and liaison with electrical manufacturers on technical problems is essential. Good salary will be paid to suitable applicant. Applications in writing stating age, qualifications and experience to Personnel Manager, Box ME.887, A.K. Advg., 212a, Shaftesbury Avenue, London, W.C.2. 1045

OPPORTUNITY for young electrical engineer to join staff of progressive company. Duties involve estimating, ordering and supervision in connection with industrial electrical installations. Write giving details of training, experience and salary required.—Box 1130.

PHYSICIST. Tullis, Russell & Co. Ltd., paper manufacturers, require a physicist or electrical engineer to undertake development work in dielectrics and allied fields. Previous experience of work in similar lines desirable but not essential. Salary according to qualifications. Applications, giving details of qualifications and experience to — The Secretary, Tullis, Russell & Co. Ltd., Markinch, Fife, Scotland. 986

PROFESSIONAL firm requires electrician experienced all types electrical installations for site measurement, Bucks, Berks and Oxon area. Car owner. State age, experience and salary required.—Box 987.

PROMINENT manufacturer of electric arc welding plant requires young ambitious engineer for interesting work in his sales office, involving preparation of welding schemes, advice to customers on all types of welding applications and quotations for the requisite plant. Well-trained welding engineers looking for further scope are invited to apply for interview. Write—Box ER.1011, L.P.E., Romano House, 399/401, Strand, London, W.C.2. 1191

PROSCON thermostats. Sales engineer required for Yorkshire area. Excellent opportunity for young man. Salary, car allowance and commission. Write in full—Sales Manager, Process Control Gear, Lattimore Road, St. Albans. 1163

REQUIRED for Bristol office of leading London contractors. Young supervising engineer. Must be conversant with all types of installation work, able to control labour and handle contracts from estimate to final account. Or capable electrician or foreman, aged 30-35, who is seeking promotion to supervising grade. Details of past employers, salary/wages, etc.—Box 1223.

SENIOR designer with knowledge and experience of domestic electrical appliances for large production lines required by old-established electrical engineers for West Lancashire. 5-day week, pension scheme, canteen facilities, etc. Reply giving full details to—Box 1299.

SUPERVISOR/estimator, fully experienced up to £5,000. Own handwriting. State salary, London.—Box 1081.

SUPERVISOR (min. O.N.C.), used to all types of work to final account. State wages required.—Box 1082.

SURVEYORS conversant with profiling overhead lines. Apply in first instance to —Box 1064.

SWITCHGEAR estimator required by manufacturers of metalclad medium voltage switchgear. Duties include engineering, estimating and preparation of tenders for switchboards. Housing assistance probable. Non-contributory superannuation scheme. The company is within 6 miles of the South Devon coast. Write stating full details of experience, technical qualifications, age and salary required, to—Ottermill Switchgear Ltd., Ottery St. Mary, Devon. 1165

TECHNICAL assistant required for drafting of electrical regulations, codes of practice, etc. Graduate I.E.E. or corresponding qualification necessary, also experience in committee work and drafting of reports. Com. salary £800-£900, depending upon age and qualifications. Progressive post. Pension scheme.—Box 1251.

TECHNICAL assistant required, under thirty-five, by expanding electrical manufacturers in the Midlands to assist with tenders and contracts. Higher National Certificate or Graduate I.E.E. preferred but not essential. Excellent prospects and pension scheme. Write stating age, qualifications, experience and salary required to—Box 1167.

TEST engineer required by motor control gear manufacturer. After initial period successful candidate would be required to carry full responsibility for his work. Pension and profit-sharing bonus schemes in operation. Apply, giving full details of experience, qualifications, etc., to the Secretary, Morecambe Electrical Equipment Co. Ltd., Westgate Works, Morecambe. 1217

THE G.E.C. Engineering Works, Witton, Birmingham, 6, have one or two vacancies for suitably qualified men for estimating work in the rotating plant and transformer divisions. H.N.C. standard and some contract or estimating experience required. Good salary, pension scheme and assistance with removal expenses. Apply giving full details of apprenticeship and career to date to the Staff Manager.—Box 1294.

TRANSFORMER designer for transformer and L.F. chokes: (a) Laminated and "C" core pattern up to 5 kVA; (b) Power transformers up to 500 kVA. 5-day week. Contributory pension scheme. Apply—Willesden Transformer Company Ltd., Manor Park Road, London, N.W.10 (Elgar 5445). 1137

TRANSFORMER designer required by young expanding company. Opportunities for practical test and development work. Apply to —Chief Engineer, Twickenham Transformers Limited, 301, Richmond Road, Twickenham, Middx. (Popesgrove 9141/2). 9766

VACANCY for clerk of works (electrical) in Inverness area. Salary range £680 rising to £850 per annum, starting pay dependent on applicant's age. Qualifications and experience: Ordinary National Certificate in Electrical Engineering or equivalent standard, five years' apprenticeship or its equivalent, and three years' experience with an electrical engineering firm. Write stating age, qualifications and experience to—C.R.E. Highlands, Balhousie Castle, Perth. 1298

WORKS electrical engineer required by large internationally known organisation to look after and control all aspects of works engineering and maintenance in the United Kingdom branches, which number 17, and to be responsible for dealing with the building of overseas factories and offices. Applicants must be under 35 years of age and be primarily electrical engineers, and have had experience also in engineering, heating, insulation, general construction of buildings, steam boilers and their installation and use, and general aspects of works engineering and maintenance duties. Write giving full particulars of experience, qualifications, salaries earned and salary required to—Box J.276, c/o Central News Ltd., Pemberton House, East Harding Street, London, E.C.4. 1237

YOUNG electrical engineer interested in the design, development production and testing of medium voltage switchgear and control gear required. Congenial conditions, canteen facilities and social club. Apply Secretary, Lancashire Dynamo Nevelin Ltd., Hurst Green, Oxted, Surrey. 1024

### APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

## SITUATIONS WANTED

CABLE jointer seeks overseas position, age 47, teetotal, with several overseas contracts experience.—Box 9729.

ELECTRICIAN, 40, Royal Navy artificer 12 years, subsequently M.N. chief elect. 5 years. Seeks overseas employment, preferably harbour board/port authority. Wide experience marine equip. afloat, ship repair, ship building U.K. and Continent. Available mid August, 1959.—Box 9763.

ENGINEER, A.M.I.E.E., A.M.A.I.E.E., 3 years South America, with heavy electrical power experience, desires interesting overseas position.—Box 9755.

PAKISTANI (Muslim) electrical engineer, highest professional qualifications (M.I.E.E.), foreign education and training and 20 years' experience (several years in senior position) in electrical planning, installation, maintenance and repairs of E.H.T., H.T. and L.T. equipment, plant and machinery including huge supply networks, requires senior position in Persian Gulf/Middle East or in Colonies. Good and active organiser with initiative. Age 47 years. Bona fide employers please write to —Electrical Engineer, P.O. Box No. 389, Lahore, Pakistan. 9758

WORKS executive over 30 years with leading electric lamp manufacturer seeks change, technical sales preferred.—Box 9764.

## ARTICLES FOR SALE

### CITY OF MANCHESTER

THE Transport Committee invite offers for the following secondhand equipment which is surplus to requirements :—

(a) One Mobile Electricity Generating Plant, 60 kW.

(b) One B.T.H. 1,500-amp., 400-v., 50-cycle Metering and Isolating Cubicle with various items of equipment.

Further particulars, form of offer, etc., obtainable from the General Manager, Manchester Corporation Transport Department, 55, Piccadilly, Manchester, 1.

Offers returnable by 10 a.m. on the 1st September, 1959. 1243

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Airedale Electrical & Mfg. Co. Ltd. 22
Airmec Ltd. 30
Arcolectric Switches Ltd. 42
Associated Electrical Industries Ltd. (Turbine Division) 38
(Switchgear Division) 54
Atlas Lighting Ltd. 84

B.I.P. Chemicals Ltd. 62
B.S.A. Tools Ltd. 6
Banner Electric Co. Ltd. 141
Becker, Geo., Ltd. 107
Belling & Lee Ltd. 118
Berry's Electric Magicoal Ltd. ... 40 & 41
Bill Switchgear Ltd. 3
Birch, H. A., & Co. Ltd. 30
Brentford Transformers Ltd. 90
Bristol Siddeley Engines Ltd. 39
British Insulated Callender's Cables Ltd. Cover 2
British Klockner Switchgear Ltd... 104
British Refrasil Co. Ltd. 19
British Resistor Co. Ltd. 11
British Switchgear Corporation Ltd. 142
Brook Motors Ltd. 45
Brown, N. C., Ltd. 124
Bruce Peebles & Co. Ltd. 17
Burdette, A., & Co. Ltd. 82
Burn, Geo., Ltd. 98
Bylock Electric Ltd. 116

Carron Company 61
Carter Gears Ltd. 85
Ciba (A.R.L.) Ltd. 71
Clevedon Rivets & Tools Ltd. 106
Collins Electrical Ltd. 56
Colne Switchgear (K & W) Ltd. ... 30
Constructors John Brown Ltd. 16
Controlled Heat & Air Ltd. 50
Crater Products Ltd. 100
's (Engineers) Ltd. ... 86 & 87
Compton Parkinson Ltd. 28

D.P. Battery Co. Ltd. 83
Daly (Condensers) Ltd. 111
Docker, John, & Co. (Engineers) Ltd. 52
Du Pont Company (United Kingdom) Ltd. 96

Ekco-Ensign Electric Ltd. 119
Electric Depôt Ltd. 52
Electric Elements Co. 142
Electric Elements (Willenhall) Ltd. 42
Electro Methods Ltd. 36
Ellerstyle Eng'g Co. Ltd. 29
Ellison, George, Ltd. 77
Eltron (London) Ltd. 20
Engel & Gibbs Ltd. 88
English Electric Co. Ltd. 9
Evans, F. W., Ltd. 107
Everett Edgcumbe & Co. Ltd. 80
Express Transformers & Controls Ltd. 102

Falk, Stadelmann & Co. Ltd. 51
Ferranti Ltd. 66
Field & Grant Ltd. 91
Fischer Bearings Co. Ltd. Cover 3
Fitter & Poulton Ltd. 107
Foster Transformers Ltd. 110

Geipel, W., Ltd. 116
General Electric Co. Ltd. 57, 122, 123 & 126
Genristo Ltd. 34
Great Bridge Foundry Co. Ltd. 103

H.V.E. (Electric) Ltd. 106
Hackbridge & Hewittic Electric Co. Ltd. 105
Hall & Pickles Ltd. 109
Heatrae Ltd. 1
Hendrey Relays Ltd. 98
Henley's, W. T., Telegraph Works Co. Ltd. 58 & 59
Hilmor Ltd. 34
Hoffmann Mfg. Co. Ltd. 91
Hyde, J. B., & Co. Ltd. 106

I.A.C. Ltd. 120
Ilford Ltd. 32
Imperial Chemical Industries Ltd. 97
Inductive Appliances Ltd. 100
Insuloid Mfg. Co. Ltd. 104
Irish Cables Ltd. 94

Jackson Boilers Ltd. 14
Jennings Engineering (Gt. Britain) Ltd. 60
Johnson & Phillips Ltd. 89

Kleen-e-ze Brush Co. Ltd. 45

Lithocite Insulators & St. Albans Mouldings Ltd. 20
Logan, W., & Co. Ltd. 124
London Electric Wire Co. & Smiths Ltd. 33
Long & Crawford Ltd. 113
Low Moor Alloy Steelworks Ltd. ... 69
Lyons, Claude, Ltd. 103

M. & C. Switchgear Ltd. 63
Macfarlane Engineering Co. Ltd. ... 44
Maclaren, R., & Co. Ltd. 108
Martindale Electric Co. Ltd. 116
Metropolitan Vickers Electrical Co. Ltd. Cover 4
Metway Electrical Industries Ltd... 45
Micanite & Insulators Co. Ltd. 37
Midland Dynamo Co. Ltd. 108
Midland Electric Mfg. Co. Ltd. 4
Midland Silicones Ltd. ... 73, 74, 75 & 76
Monmer Foundry Ltd. 141

Nalder Bros. & Thompson Ltd. 23
Neco Geared Motors Ltd. 20
Neo Electrical Industries Ltd. 142
Newman Industries Ltd. ... 47 & 48

Oliver Pell Control Ltd. 25
Ormond Eng. Co. Ltd. 10
Ottermill Switchgear Ltd. 81

P & B Engineering Co. Ltd. 8
Perkins, J. M., & Smith Ltd. 120
Philips Electrical Ltd. 7
Powder Couplings Ltd. 118
Precision Screw & Mfg. Co. Ltd. ... 52
Pyrotenax Ltd. 27

Quicksilver Tube Mfg. Co. 106

Ransome & Marles Bearing Co. Ltd. 68
Rateliff, J. F. (Metals) Ltd. 25
Record Electrical Co. Ltd. 67
Reyrolle, A., & Co. Ltd. 15
Rist's Wires & Cables Ltd. 35
Robinson, D., & Co. ... 52 & 106
Robinson, L., & Co. Ltd. 124
Rollet, H., & Co. Ltd. 16
Rowlands Electrical Accessories Ltd. 53
Rozalex Ltd. 25
Ryman, F., Electrical Ltd. 116

Salter, Geo., & Co. Ltd. 12
Sanbra Ltd. 118
Sanders, W., & Co. (Wednesbury) Ltd. 78
Santon Ltd. 24
Scholes, Geo. H., & Co. Ltd. 18
Sheffield Twist Drill & Steel Co. Ltd. 70
Siemens Edison Swan Ltd. Cover 1 & 121
Simmonds & Stokes (Niphan) Ltd. 120
Simplex Electric Co. Ltd. ... 92 & 93
Smith & Davis Ltd. 112
Smith, Herman, Smithlite Ltd. ... 115
Smiths Industrial Instruments Ltd. 31
Standard Telephones & Cables Ltd. 43
Statter, J. G., & Co. Ltd. 95
Sterling Varnish Co. Ltd. 29
Sturdy Electric Co. Ltd. 46

Taylor, Armand, & Co. Ltd. 46
Telegraph Construction & Maintenance Co. Ltd. 99
Terry, Herbert, & Sons Ltd. 21
Thorpe, F. W., Ltd. 55
Transformer & Electrical Co. Ltd.... 52
Tungstone Products Ltd. 19
Turners Asbestos Cement Co. Ltd. 117
Turnock Geo. Ltd. 124

Varilectric Ltd. 114
Venner Ltd. 5
Vernons Industries Ltd. 50
Victor Products (Wallsend) Ltd. ... 111
Volex Electrical Products Ltd. 13

Walsall Conduits Ltd. 26
Wandleside Cable Works Ltd. 2
Watson, R. & W., Ltd. 112
Westinghouse Brake & Signal Co. Ltd. 101
"Wireless World" 112
Wootton & Co. Ltd. 49

Yorkshire Switchgear & Eng. Co. Ltd. 125

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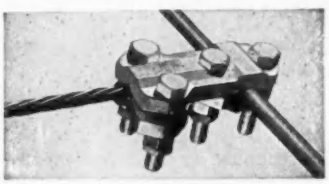

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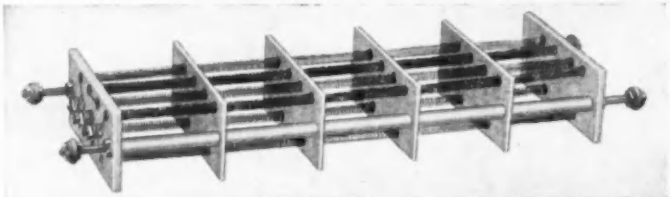

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d. Cover I & 121
phan) Ltd. 120
92 & 93
112
e Ltd. 115
nents Ltd. 31
Cables Ltd. 43
95
29
46
td. 46
Mainten-
99
Ltd. 21
55
Co. Ltd. 58
19
Co. Ltd. 117
124
114
5
50
d) Ltd. 111
Ltd. 13
26
Ltd. 2
112
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101
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49
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MINIATURE
BEARINGS

range in size from 1·5 mm. o.d. to 10 mm. o.d. Some are made with open cups which allow clearance for spindle extensions, ranging from 0·25 to 2 mm. Full particulars and sizes are available on application.

*The bearings illustrated are actual size.*

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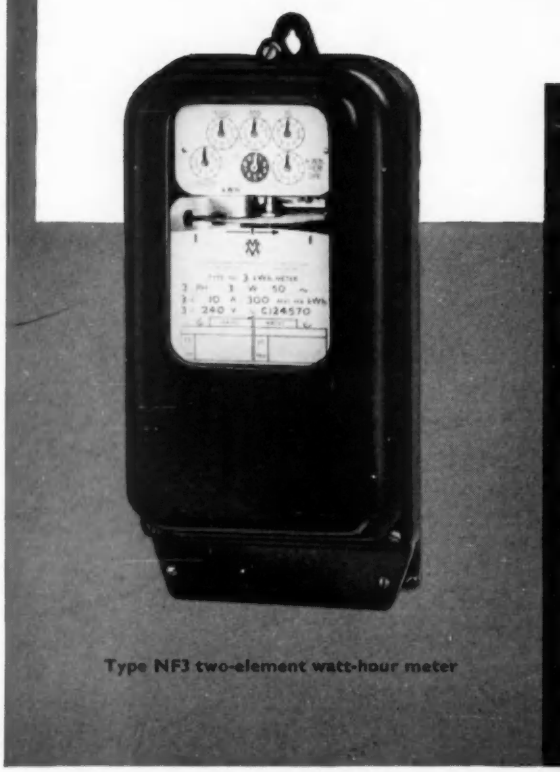
# Accent on Accuracy

## WITH THE TYPE NF SERIES

The type NF3 (two-element) and NF4 (three-element) watt-hour and maximum demand meters have been designed to meet present day requirements for overall accuracy. Their easily accessible adjustments, lightweight construction and handsome appearance, will commend themselves to all users. The meters comply in all respects with British Standard 37: Part 4: 1954 and Part 5: 1955.



Type NF3 two-element watt-hour meter

Type NF4 three-element maximum demand meter

For further information please write for 'The Art of Metering', which gives full details of these meters.

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